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ABSTRACT

A staff improvement course was developed by an intern at the technical information center (TIC) at Owens-Illinois, Inc. (O-I). First an analysis was made of the information center itself--its goals, services, literature search procedures, information sources, and the function of the information representative-analysts. Next a comparison was made between scientific/technical and social service information services. The personalities of individuals working at TIC were also considered. Several projects were planned or attempted, and a staff improvement course was selected for development. Designed to train technical personnel in information service techniques, the course was planned to cover request negotiation, search strategies, use of print and computerized sources, and reference and bibliographic services. Though the course was not completed, informal evaluation showed that it had some value. Recommendations were evolved for O-I in general, its department of library and information science in particular, and TIC's future interns. Appendixes contain the course outline, a course handout, a proposal for new search aids, and search models. (LS)

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A Thesis
entitled

Improving Literature Searching in a Technical Information Center, an Internship and a Staff Improvement Course at the Owens-Illinois Technical Information Center

by

Charles I. Terbille

as partial fulfillment of the requirements of
the Master of Arts Degree in
Library and Information Services

Miles Martin
Advisor

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U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
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The University of Toledo
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TABLE OF CONTENTS

Page

INTRODUCTION. vi

CHAPTER ONE. THE ENVIRONMENT OF THE OWENS-ILLINOIS TECHNICAL INFORMATION CENTER: FUNCTIONS AND FACILITIES. 1

Introduction 1
Goals and Objectives of the TIC. 2
Information Representatives-Analysts 3
Reference Librarian. 6
What a Search Entailed 9
Sources of Information to be Searched. 12
Summary. 15

CHAPTER TWO. SCIENTIFIC AND TECHNICAL INFORMATION AND SOCIAL SERVICE INFORMATION: A GENERALIZATION. . . 16

Introduction 16
Comparison of O-I and OCR as Examples. 17
Science, Engineering, and Business at O-I. . . . 20
A More General Typology. 25
Structure of Social Service Information. 29
Potential Applications 32
Example of Housing Problems. 34
Summary. 36
Closing Word: Technical Information v. Community Information Again 37

CHAPTER THREE. THE ENVIRONMENT OF THE OWENS-ILLINOIS TECHNICAL INFORMATION CENTER: PEOPLE BEHIND THE POSITIONS 41

Introduction 41
The People at the TIC. 42
How Did I Fit In?. 49
Attitudes Toward Computers 52
TIC People v. Community Organization People. 53
Summary. 57

Page

CHAPTER FOUR. PROJECTS CONSIDERED, PLANNED AND UNDERTAKEN. 58

Introduction 58
Cost Effectiveness Study Rejected. 58
New Search Aids. 62
Development of a Model of the Search Procedure 68
Evolution of a Staff Improvement Course. 73
Actual Design of the Course. 75
Summary. 80

CHAPTER FIVE. EXECUTION OF THE STAFF IMPROVEMENT COURSE. 81

(A continuous narrative)

CHAPTER SIX. EVALUATIONS AND RECOMMENDATIONS 94

Introduction 94
Evaluation of the Course 94
Recommendations to Owens-Illinois. 99
Recommendations to the Department. 101
Recommendations to Future Interns. 108

APPENDIX I. HANDOUT FOR INSTRUCTING THE TIC STAFF HOW TO GET ON THE SDC DATA BASE. 111

APPENDIX II. PROPOSAL FOR NEW AND REVISED SEARCH AIDS 113

APPENDIX III. JOB DESCRIPTION PREPARED FOR LOU ALLEN. 119

APPENDIX IV. FIRST DRAFT OF MODEL. 124

APPENDIX V. REVISED DRAFT OF MODEL 130

APPENDIX VI. COURSE OUTLINE. 139

APPENDIX VII. MODEL AS PRESENTED TO CLASS. 141

LIST OF TABLES

Table Page

1 STRUCTURE OF INFORMATION AND PHYSICAL FORM. 24

2 FOUR TYPOLOGIES OF INFORMATION COMPARED 32

LIST OF DIAGRAMS

Diagram Page

1 HAVELOCK'S MODEL OF MESSAGE TYPES 27

2 RELATIONSHIPS IN VPCS EXHIBITED BY GRAPH THEORY. 33

INTRODUCTION

Often a thesis will turn out to be more complicated and more time consuming than anyone had anticipated. That is what happened in my own case. As an intern I worked as a literature searcher in the Owens-Illinois Technical Information Center. In time I would suggest minor ways to improve searches, attempt to produce a formal model of the search process, teach a course to help others improve their searches, and finally serve as reference librarian. The thread of continuity that seems to run through these episodes is the concern to improve literature searching.

This thesis will be arranged according to a scheme usually called CIPP. The acronym derives from the first letters of the words context, input, process and product. Following this scheme I will first examine the environment (or Context) of the Owens-Illinois Technical Information Center. Then I will discuss the various courses of action (or Inputs) that I could have undertaken and the ones that I actually did undertake. Since I undertook several projects, I will focus on a single one: the teaching of a staff improvement course. I will describe the planning and the execution (or Process) of this course. In conclusion I will attempt to evaluate the results (or Product) and make some recommendations.

CHAPTER ONE

THE ENVIRONMENT OF THE OWENS-ILLINOIS TECHNICAL INFORMATION CENTER: FUNCTIONS AND FACILITIES

Introduction

In describing the environment which the Owens-Illinois Technical Information Center constituted, I have chosen to neglect such factors as the history of the company and the outward appearance of the place. Neither of these elements is of great moment for a community information specialist when set against (1) the functions and facilities of the Technical Information Center, (2) the nature and structure of the information which flowed through it as compared to the information which flows through a community social service organization, and (3) the characteristics of the people who worked there. I will devote a chapter to each of these aspects of the environment.

My remarks about the functions and facilities of the Technical Information Center will begin with a review of the overall goals and objectives of the Center. Then, since this thesis is principally concerned with literature searching, I will describe the activities of the Information Representatives-Analysts and the Reference Librarian, these being the roles in the organization devoted to searching. Finally, I will describe what an "average" search entailed and what kinds of sources were to be consulted.

Goals and Objectives of the TIC

The goals of the Technical Information Center (or TIC) were quite broadly defined. To quote a brochure which was designed to explain the workings of the TIC to Owens-Illinois employees, the Center "was created to provide information services and systems specifically designed for the entire O-I technical community."[1] The key word here is "technical." The Information Center is located in the heart of the corporate research complex in the neighborhood of the University of Toledo. The orientation of the TIC, therefore, differs from that of three libraries which the corporation maintains in Toledo, viz. a business library and a marketing library in the corporate headquarters, and a small library devoted to food packaging in yet another location, the Dura Center.

Now the reader will have noted that the other installations are called simply libraries and not information centers. The reason for this nomenclature is to be found in the history of the Center. Originally the company maintained two separate facilities: a Technical Information Center and a Research Library. The mission of the original Information Center was to collect, index, store and retrieve technical documents which O-I employees, especially researchers wrote in the course of their work. The Research Library, on the other hand, dealt with documents in the public domain: books, periodicals, pamphlets, and offprints, government publications, etc. This facility performed all the services a library normally performs. Its people selected, acquired, processed, stored, circulated, and maintained books and documents; they published a library bulletin to call their clients' attention to new books and articles which might be of interest; they answered reference questions, and they did retrospective literature searches. The company wisely decided to merge the two units concerned respectively with external and internal sources of information, but to retain the name "Technical Information Center."

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[1] "The Owens-Illinois Technical Information Center," (Toledo: Owens-Illinois, Inc., 1972), unpublished brochure ADM-TC-11-4/72, Introduction.

Information Representatives-Analysts

Although the history of the TIC determined its function to a certain extent, it was more thoroughly shaped by the decisions of Jack Ormond. Jack was manager from 1970 until the end of February 1975, approximately one month before the end of my internship. Jack's chief innovation at the TIC was the creation of the position of Information Representative or Information Analyst. The term Information Representative was used in the brochure for O-I employees; the term Information Analyst appeared in the more recent organization charts. The two names reflected the two-fold nature of the position.

First, Jack believed in the value of personal contact and wanted someone from the TIC to be in touch with every major new project undertaken in the corporate research facilities. Consequently, the basic role of an Information Representative was to seek out the patrons of the TIC instead of merely waiting for them to come to it, and when they did come to the TIC, to provide personal contact and continuity. In discussing with me the role of the Information Representatives Kaye Soka, Jack's second in command, emphasized the importance of a tactical decision he made. He could have taken library professionals and attempted to integrate them into the life of the Tech Center. Instead, apparently because he foresaw better rapport, Jack chose to take technical people, those already integrated into the life of the Tech Center, and attempt to make them proficient in searching and analyzing the literature.

The Information Representative often sought out his clients quite literally, by going to their offices and laboratories, observing and asking questions. Even the lunch room was a good place for the Information Representative to perform his function. The reasoning behind this aggressive policy was that the potential patron might not know what kinds of material the Technical Information Center could provide, that an understanding of individuals was necessary to an understanding of their problems, and that the sooner one knew what information would be needed the easier it would be to supply it.

A desirable side effect of this policy was that the TIC promoted communication between the various research units. To someone who does not know how far the technical interests of Owens-Illinois Inc. extend, this last statement may not mean much. Let me explain, then, that the fundamental products of the company are packaging materials and machines: glass, plastic, and paper containers of many sorts. But in addition, they make television tube bulbs, laser glass, plywood, certain kinds of biomedical equipment, computer display panels, and toys and games. Undoubtedly there are even more products of which I am not aware.

"Information Analyst" was the second term used to describe the new position. This name refers to the fact that those who held the position scanned and abstracted journals and produced bulletins containing information which they deemed to be of value for selected groups of clients of the Technical Information Center. One such bulletin was entitled "Selected Citations on Oriented Polymers" (or SCOOP), and it was sent to about a dozen men who had to deal with plastic materials and their properties. A list of the rest of these bulletins would be of little value, for every year or two one of these publications ceased and another was begun. It is of value, though, to understand the purpose: current awareness and anticipation of need. It was assumed that certain individuals and certain groups, by the very nature of their work, would want to keep up with the latest developments in certain fields and that they would sooner or later need information on a given topic. For example, a research team trying to develop a better way to make plastic bottles would sooner or later need to know about oriented polymers. If the Information Analyst judged correctly, the client would have an accumulating file of information which would answer many questions almost before they occurred.

In addition to representing the TIC and analyzing journals for current awareness, the encumbents of the new position created by Jack Ormond did more traditional retrospective literature searches for their clients. Although several of the members of the library staff shared all these functions with them, I think it appropriate to describe only the position of Reference Librarian. There are two reasons for this: I worked very closely with Frances Spring, the Reference Librarian, and later I became Reference Librarian myself.

Reference Librarian

(I will use capitals to distinguish the Reference Librarian of the TIC from any reference librarian). The Reference Librarian might be called the Information Representative at Large. As a matter of fact Frances Spring was also an Information Representative pure and simple. She was assigned clients and scanned certain publications, notably the Government Reports Announcements. But there was a tacit assumption that she should not spend much time away from the reference desk. This assumption came to light in the following way. In February 1975, Frances had taken early retirement.

Consequently, Jack Ormond asked the Information Representatives to take turns at the reference desk. Word got back to Jack that library users were interpreting the constant change of personnel as a symptom of incompetence. As a matter of fact, this interpretation contained a kernel of truth since few of the replacements had either training or experience as a reference librarian. At any rate, when Jack and Joyce Schifferly asked me to become Reference Librarian, one of the reasons they gave was that the constant changing of the person at the reference desk was not good for the TIC image.

I have digressed slightly to show that the Reference Librarian was expected to be aggressive without leaving the reference desk for long. He or she was also supposed to represent the Technical Information Center to researchers who came in person to use the library and he or she was to help the Information Representatives, too, when they had trouble locating documents on the shelves, or when they had not the slightest idea where to hunt for required information. Now, these objectives may have been set down on paper, but the very physical plan of the Technical Information Center tended to reinforce them. For the reference desk was located next to the stacks and was walled off from the rest of the staff area by a special bookcase containing reference books. This bookcase was some eight or nine feet tall and ran almost the entire width of the floor, leaving on either side only a narrow passage the size of an ordinary doorway. The effect of this separation was to divide the Technical Information

Center into two rooms: one for the Reference Librarian and the stacks, and another for the rest of the staff. It was as though the stacks were a huge machine and the Reference Librarian were the operator and the instructor who taught people how to use the machine.

Not only was the Reference Librarian supposed to help those who came to the library in person, but he was also to answer questions called in by telephone. These questions had a far-reaching effect on the nature of the job, for it was (and is) a point of honor among reference librarians to answer phone calls as quickly as possible. Anyone who has been asked to wait an hour or so for information he needs immediately, especially when he thinks he could easily find it himself, were he in the library, understands why this point of honor exists. At Owens-Illinois the manner of the caller and the pace of his voice usually indicated that he was in a big hurry, and thus the normal drive to deliver a speedy reply was augmented. Of course, this speed brought with it a good bit of nervous pressure.

The activities of helping library users and answering reference phone calls were complicated by the fact that not every problem directed to the Reference Librarian fell into the narrow domain of reference problems. For example, because of the floor plan of the library a user would naturally ask the Reference Librarian whether a book was checked out when he could not find it on the shelf. Now the circulation files were supposed to be the concern of the

Circulation Department which was located in the other "room." Therefore, the Reference Librarian ought to refer the user to someone else. But suppose the book was not checked out; then the user would be sent back to the Reference Librarian to investigate other possibilities such as (for instance) that the book was oversize and the user had missed the symbol in the call number which was intended to alert him to this fact. Thus in many cases it seemed better for the Reference Librarian to avoid this bureaucratic runaround and check something in the circulation files himself. Similarly the Reference Librarian had to be familiar with the files and workings of the rest of the Technical Information Center, because needs for information were not as neatly categorized as was the organization which tried to satisfy them.

What a Search Entailed

At this point the reader may be thinking "Files? What were those files like?" Let me expand the question somewhat. Retrospective searches were the activity of the Technical Information Center with which I as an intern was chiefly concerned. Since I have said that the Information Representatives and the Reference Librarian performed retrospective searches, it is appropriate to ask (1) What was the normal search procedure? (2) What were the sources to be searched? and (3) How complicated were these things? In answering these questions I will try to follow the path of normal search and to describe what a normal searcher did. I warn the reader that these norms are subjective; nevertheless I hope they will prove enlightening.

The search for information always began with some kind of statement, however nebulous, about what was being sought. It might have been a formal request for a search or a reference question. The Information Representative himself might even anticipate that his client would need to know something. But more usually, it involved negotiating a request, that is, the searcher had to do some probing and checking to make sure that he discovered what his client really wanted to know, that the client was not holding something back and assuming that the TIC could not provide certain information, that he understood sufficiently the client's terminology, and that he would not duplicate the client's own efforts.

Depending on the nature of the request and of the client, the searcher might follow one of several courses. If the request seemed straightforward, the material required was not voluminous, and he had a good idea where to look for it, he would try to find it almost immediately, especially if the requester needed it in a hurry. Most of the time, however, the searcher would mention the new search at the morning operations meeting. His explanation of the new problem would often bring a flurry of suggestions from the others in the meeting. Jack Ormond might even ask different searchers to help each other. But for the most part the final judgement concerning which sources to consult and in what order, was left to the discretion of the individual searcher.

Before speaking about the sources available, I must elucidate a few more features of the normal search procedure. Extensive searches usually involved a reiterative procedure. For example, checking the last twenty cumulations of the Applied Science and Technology Index under the same heading would mean pulling a volume off the shelf, opening it, and hunting for a word twenty times. This demanded perseverance on the part of the searcher. Since it would be foolish to go through all this work and copy numerous citations only to find that the results did not really satisfy the requester, the searcher often returned to the requester with sample results before executing an extensive search. Thus he could perfect his plans before he expended a great deal of effort.

Extensive searches also gave rise to search records. The searcher would record the request and the sources which he consulted together with a copy of the resulting bibliography. These records were indexed as internal reports. In this way a searcher might be able to update an older bibliography instead of repeating an extensive search.

Because I have noted these features of extensive searches the reader should not get the impression that the TIC did not handle other kinds of searches. In many subtle ways it was assumed that the Information Representatives would perform most of the extensive searches while the Reference Librarian would handle the "quickie" searches that reference questions occasion. Yet no one seemed to distinguish the types very clearly, and both the Information Representatives and the Reference Librarian were engaged in all kinds of searches.

Sources of Information to be Searched

Having discussed the search procedure, I will now say something about the sources of information available at the TIC. The reader must have some feeling for the complexity of these sources to appreciate what follows. The sources are best divided into the internal ones belonging exclusively to O-I and the external ones in the public domain.

Earlier I mentioned the flurry of suggestions which greeted a new search in the morning operations meeting. These suggestions were most often referrals to O-I people who were likely to know at least some of the required information. To support and augment the memories of O-I researchers there were the internal documents. These included among other things bound formal reports and letter reports. The mechanical apparatus for indexing reports comprised two separate systems because the TIC had switched in the early 1960's from Hollerith cards to optical coincidence cards, but they had not converted the old records to the new system. A change in the thesaurus of terms used for indexing had, of course, accompanied the change in the physical apparatus. Matters were further complicated by the fact that the author file of the second, later, system was maintained on a separate set of ordinary five by eight inch cards. These cards were not located in the same place as the rest of the system. In yet a third place in several looseleaf notebooks, they kept a record of the reports organized according to corporate division.

Technical lab notebooks should also be included with internal documents. The Technical Information Center issued, collected, stored and circulated them. Although there was no subject access to these documents they were indexed by author and a separate circulation file was maintained for them. Finally there was a special computerized system to store certain test data concerning every new glass composition produced by O-I researchers. This was called the Melt Data System or MDS.

Thus the body of internal documents was extensive and the systems used to index them were complicated. I should point out that a single search rarely took a searcher into all kinds of internal documents and that many times it would be limited to external sources. I do not think it will serve any useful purpose to enumerate all the external sources available at the Technical Information Center. Instead, I will list general classes of tools.

The TIC subscribed to both the System Development Corporation and the Lockheed interactive retrospective computerized search services. This means that the searcher would sit at a terminal in the Technical Information Center which was connected by long distance telephone lines to the computer of SDC in Santa Monica or of Lockheed in Palo Alto. Using their retrieval program he would search the data bases which these companies had purchased and made available to subscribers. At any given time five or six data bases or "files" were accessible. One of these files was roughly equivalent to a four or five year cumulation of a specialized index, say, a Chemical Abstracts cumulative index. Searches were further complicated by the fact that the searcher could, within limits, alter the format of the retrieval program, and select the data elements (author's name, journal code, keywords, etc.) he wished the computer to search and to print out. Since this computer service cost up to $100 an hour it had to be used with care.

The computerized data bases were one rather glamorous external source of information. Another was the Visual Search Microfilm catalog service. This was a collection of manufacturers' catalogs reproduced on microfilm cartridges for compact storage and easy access. Recordak reader-printers made it even easier to use the VSM F, because they wound and unwound the film with an electric motor and could make hard copies instantly. The Technical Information Center also collected certain printed catalogs and special issues of certain trade journals, for example, the Chemical Equipment Buyers' Guide and the Modern Plastics Encyclopedia (a special issue of Modern Plastics).

Finally, most of the external sources were normal printed materials: directories (which lead to people and organizations), journals, indexing and abstracting services, specialized encyclopedias, dictionaries, handbooks, introductory textbooks, bibliographies and all the other sorts of publications one customarily associates with a science and technology library. (See also Appendix II) These publications were all cataloged, of course, and to aid searchers Kaye Soka had prepared a list of the more commonly used secondary printed sources (i.e. bibliographies, indexes, etc., as opposed to encyclopedias or journals).

Summary

In this chapter I have stated the overall goals and objectives of the Technical Information Center and described the activities of the Information Representatives-Analysts and the Reference Librarian in carrying out the goals and objectives. I have placed special emphasis on the procedure and sources for searches, because as an intern I dealt most directly with the activity of searching. Although I have said very little directly about the subject matter of the internal files and the external literature with which the Technical Information Center dealt, enough glimpses have shone through indirectly so that the reader may well ask, "What has this got to do with a Community Information Specialist?" I believe the answer to this question is complicated enough to require a separate chapter.

CHAPTER TWO

SCIENTIFIC AND TECHNICAL INFORMATION AND SOCIAL SERVICE INFORMATION: A GENERALIZATION

Introduction

Some readers may find this chapter out of order. I have put it in this position because I wish to generalize and apply some of my observations of the workings of the Technical Information Center. Readers who want to know what happened next in my internship at O-I are directed to Chapter Three.

Someone who has read my description of the Technical Information Center may well ask, "What has this got to do with a Community Information Specialist Program?" When Miles Martin, the chairman of my department first negotiated an internship contract with Jack Ormond, he justified the appropriateness of the environment by postulating that a student working for a profit making organization and dealing with technology could learn principles of information handling that would apply as well to nonprofit community organizations and in dealing with Social Services. To follow the reasoning inherent in the history of the internship, then, a comparison of the two kinds of organizations and the information they deal with should lead to useful generalizations. It will also afford an opportunity to describe the environment of TIC in more general, more abstract terms.

Comparison of O-I and OCR as Examples

It is obvious that the nature and the goals of an organization determine what information it handles and how. Therefore, I wish to compare, as somehow typical or representative, the nature and goals of the Owens-Illinois Technical Information Center with those of the Office of Community Relations of the Catholic Diocese of Toledo, since I have worked for both organizations. I am well aware that any generalizations which emerge from a comparison of single instances are the subjective ones of personal learning and not the objective ones of science. Yet it is not my purpose in this thesis to establish profound and immutable laws of library science, but to report my experiences.

How then, did the Technical Information Center differ from the Office of Community Relations of the Catholic Diocese of Toledo? The former was obviously larger with a staff of about 15 or 16 compared to 9 or 10 at OCR. TIC was organized as a library-information center with some of the latest equipment and methods, including computer data bases, microfilm readers, and a carefully designed periodical routing and excerpting system. All the OCR could boast were the few books, documents, and files which the individual staff members had amassed. The hours of the TIC staff were regular: 8:30-4:30, and there was usually a meeting every morning. OCR people were in and out of the office at irregular times, and they held a staff meeting once a week. Finally, I would guess the budget of the TIC to be at least ten times that of the OCR.

How did these factors affect the way the two organizations handled information? First, the TIC was very self-consciously devoted to information storage and retrieval, while the OCR merely communicated or used what information it possessed or pursued to carry out other more fundamental goals, such as social justice or social change. With more employees and more money, the TIC handled a far greater number of books and documents, and, therefore, probably a greater "quantity" of information. The hours of the TIC reflected a more routinely planned activity. In other words, the manager of TIC could always presume that part of his staff would routinely select, purchase, catalog, search for, and circulate documents, and maintain internal files. In contrast, the people at OCR might conduct a mass education campaign at one time, lobby in City Council at another time, and decide how to channel funds at yet another time. The sources of information needed in these episodes would be more varied and involve less "routine" library work. What is more, OCR staff workers seemed to have more voice in making policy decisions than the Information Representatives at TIC. These policy decisions occasioned the OCR staff to "consume" information in a way that the TIC staff did not.

But all these comparisons are trivial when placed beside the main one. The main difference lies in the subject of the information the two organizations dealt with. The TIC circulated theories about lasers, data about glass melts or news about competing companies. OCR tried to collect and to send out statements about people and their difficulties, and I believe any community service agency would need this sort of information. In this respect it would be more appropriate to compare the Office of Community Relations with O-I's Marketing Library.

This is obviously not the place to explain in detail the difference between the physical science that the TIC used, and the various kinds of social philosophy, theology, and other information which a community organization like OCR would use. A couple of observations must suffice. Perhaps the chief distinction between the two types of information is that physical nature cannot deceive us and physical scientists or engineers are not in the habit of telling intentional lies about nature. Human beings, however, can deceive us, and politicians or community leaders are expected to "twist" the truth, dodge, fillibuster, etc., in order to promote their cause. The other difference between physical science and social service information is that the discussion and explanation of physical phenomena does not change their behavior the way a dogma concerning mankind changes persons. A molecule or a machine has no self-consciousness, but a human being does.

In an attempt to reconcile the disparity between these two types of information then, I must turn away from the nature of the two subjects to the structure of the two bodies of information. First, I will propose a threefold typology of the information handled by the Technical Information Center.

Then I will introduce the more general terms and concepts of Ronald Havelock. Finally, I will try to produce a structural description of social service information from the first two analyses.

Science, Engineering, and Business at O-I

In Chapter One I referred to the brochure designed to acquaint O-I employees with the Technical Information Center. The very first sentence of this document states, "Owens-Illinois is dedicated to a position of technical leadership in its established businesses and in selected new fields of technology as they apply to potential new markets."[1] The person who wrote this sentence maintains that O-I differs from many other businesses in that it must use technical information as distinct from other kinds: marketing information, financial information, inventory information, personnel information, etc. Now nearly every manufacturer uses technical information to design and produce his product and the persons who supply this expertise are usually called engineers. Yet Owens-Illinois is committed to leadership in technology. This means that they do not intend to wait for someone else to invent a better machine, process or material, but to do it themselves. The person who performs the research does not have a uniform title, but it is clear that he is applying science. The words "selected new fields of technology" allude to the policy that the company, desiring to participate in the technical development of new products, will monitor the progress of basic science and await the opportune moment to intervene.

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[1] "The Owens-Illinois Technical Information Center," (Toledo: Owens-Illinois, Inc., 1972), unpublished brochure ADM-TC-11-4/72, Introduction.

Since the boundaries between pure science, applied science, and engineering tend to blurr, I favor distinguishing only science and engineering to make a complete topology, consisting of three parts: science, engineering, and business.[2] Pure science is mainly concerned with how to think about things; engineering is concerned with how to design and produce things; business is concerned with how to run the actual production machinery and with how to sell things at a profit. Scientists deal chiefly with ideas; engineers, chiefly with materials, power, and machines; businessmen, chiefly with labor, financial institutions, customers, merchandise and money. The scientist wants to know what exists; the engineer, what works; the businessman, what pays off. The scientist seeks to know and to express his knowledge; the engineer seeks to achieve; the businessman seeks to compete.

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[2] Many authors who write about scientific and technical literature judge it convenient and useful to make such distinctions. For example: B.C. Vickery, Information Systems (Hamden, Connecticut: Archon Books, 1973) 47-48. C.W. Hanson, Introduction to Science-Information Work (London: Aslib, 1971) 61. S. Ranganathan, discussion of scientific writing as reported by M.W. Berry in Proceedings of the International Conference on Scientific Information, Washington, D.C., 1958, (Washington, D.C.: National Academy of Sciences--National Research Council, 1959) 1266-1267.

Science, engineering and business represent types of activity and views of the world, but what is most pertinent for my argument, the knowledge and information associated with each exhibit rather distinct characteristics. The expressions of science are intended to have the widest application and the longest life, and therefore, are most appropriately contained in printed books. Yet paradoxically, the scientist doing basic research is often interested in only the most current communications, the latest issue of a journal or perhaps even a phone call from a colleague. This paradox occurs because in the course of his education the scientist has digested directly or indirectly almost all of the older literature on his special subject, and he is eager to establish a new hypothesis. If, however, he takes up a different specialty he will have to review what has been established over the years. For this purpose and others involved in science a computerized data base or printed index of the international literature is well suited.

Since the engineer seeks to use science in designing and producing things, the information he needs is narrower in scope, being limited to what is applicable, possible and practical. He will also need the measurements and specifications both actual and anticipated of a particular situation. Thus he is not so much concerned about the nature of a bridge as about how to build this out of this material across this canyon to carry this traffic etc. Such information changes as the actual or anticipated situation changes, and so it is shorter lived. It makes sense to preserve it in records like reports and blueprints of which a few copies are made or in less permanent documents like manufacturer's catalogs, paperback publications of statistics, standards and specifications or in local computer files.

But again there is a paradox. The latest theories in science are not always the most practical, and some of the oldest ones may be perfectly useful. One could, I believe, build a good simple bridge using only the mechanics of Lagrange (1736-1813). In concrete terms this means that a thirty year old handbook may be a valuable tool for an engineer.

In a company such as Owens-Illinois the business manager has to deal with science and engineering to a certain extent, but the information which is characteristic of his role has an ephemeral life span and in its application is unique to his situation. Orders, feedback, news reports, prices, decisions, such things are not best transmitted in books or journals but rather through letters, brochures, newspapers, handwritten notes, bulletin boards, telephone conversations, and face to face interviews. Mathematical computer programs, too, are a valuable resource, because they quickly transform raw data into an up to the minute summary.

Again there is an exception to the rule. Long range plans are of intermediate duration and consider general factors in the environment of the organization, i.e. the economic and technical macrocosm. Thus a long range planner is like a scientist in that he must consider the nature of things and like an engineer in that he must consider what will be possible. I hasten to add that there can be businesses, and profitable ones, without long range plans.

To clarify further what I have been saying let me put it in tabular form and then give an example of each type of information at the Technical Information Center. (See Table 1.)

TABLE 1
STRUCTURE OF INFORMATION AND PHYSICAL FORM

Information Type	Scope	Life	Physical Form
Science	General	Years	Journals, books, international data bases
Engineering	Narrower Applications	Months	Reports, measurements, catalogs, statistics, local computer files
Business	Unique Situations	Days	Letters, brochures, newspapers, notes, people, bulletin boards, computer math

When one of the Information Analysts was assigned to scan Science, Scientific American, New Scientist, and Physics Letters, he was dealing with science. Most of what these journals communicated was not of immediate value to the company; hence he only scanned them. But it could easily become very relevant due to a decision to enter a new technical field. For example, lasers were built before O-I started to manufacture laser glass. But once O-I decided to enter that field it became necessary for someone to have background in lasers.

An example of pure engineering information would be the Melt Data System. When someone was attempting to design a product that required a glass or ceramic material with certain physical properties the TIC would put these properties into the computer and it would print the codes of any glass composition in the MDS with properties close to the desired ones. The MDS was, as I mentioned in Chapter One, a local computer file.

Finally, a printout of the accounts of the TIC or a note from a client requesting a search would be examples of business information. The Technical Information Center naturally did not deal with the financial accounts of the whole company, sales figures, production statistics, and all the more usual forms of business information.

A More General Typology

The rough typology I have just outlined obviously would not transfer well to a community organization. I propose, therefore, to begin a generalization by integrating my ideas with those of Ronald Havelock in Planning For Innovation Through Dissemination and Utilization of Knowledge.[3] On the basis of his extensive review of the literature, he proposes a four-fold morphology of message types which relate to a message system. For my purposes it will be best to summarize his views in a diagram. (Read Diagram 1 here.)

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[3] R.G. Havelock, Planning For Innovation Through Dissemination and Utilization of Knowledge (Ann Arbor, Michigan: Institute for Social Research, 1971).

Now I think that his first three types quite obviously correspond to my science, engineering, and business, respectively. If the reader wonders why Havelock has Applied Research and Development putting out "messages" rather than "knowledge," I suggest that he peruse Havelock's Chapter Seven where AR & D is portrayed as a link between science and practice. I am myself puzzled as to why the user is allowed only "messages" and not "knowledge." Havelock says nothing about the scope, life or physical form of messages and knowledge.

Also found in Havelock's Chapter Seven is a useful discussion of the pure scientist. He notes that pure scientists or basic scholars (1) are the arbiters of what constitutes their discipline (2) are the supreme generalists who "integrate disparate findings into theories that make sense out of the whole and show us where we are going,"[4] (3) are often the ones who define basic human values and ask the philosophical questions like "What is progress?" "What is well-being?" By doing these three things the basic researcher links research with practice.

Now Havelock is talking in the context of education where a dichotomy is thought to exist between the basic scholar who first articulates new ideas and the educator who passes them on to students. But his statements apply to other fields

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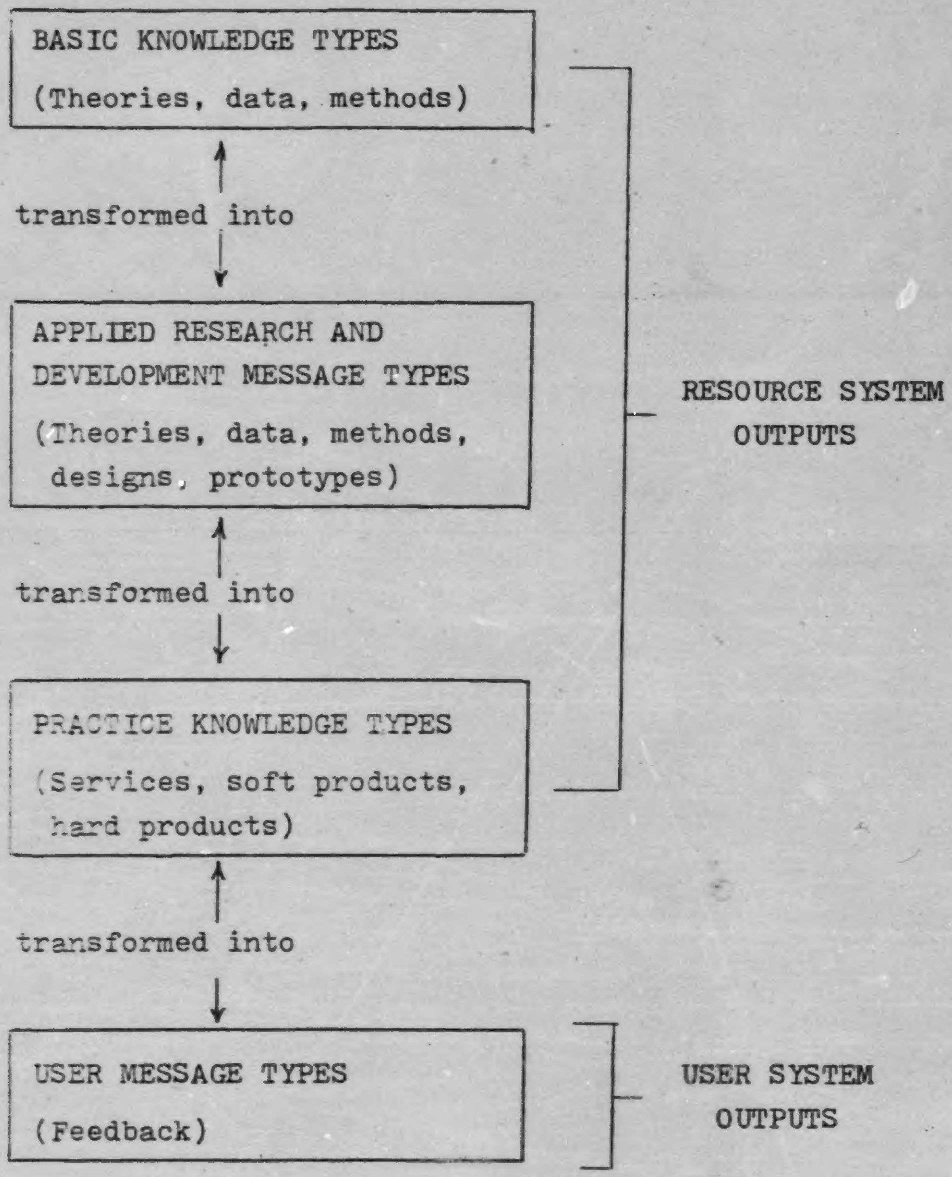
[4] Havelock, op. cit., p. 7-17.

DIAGRAM 1

HAVELOCK'S MODEL OF THE MESSAGE TYPES


BASIC KNOWLEDGE TYPES
(Theories, data, methods)
transformed into
APPLIED RESEARCH AND DEVELOPMENT MESSAGE TYPES
(Theories, data, methods, designs, prototypes)
transformed into
PRACTICE KNOWLEDGE TYPES
(Services, soft products, hard products)
transformed into
USER MESSAGE TYPES
(Feedback)
RESOURCE SYSTEM OUTPUTS
USER SYSTEM OUTPUTS

(After Ronald Havelock, Planning For Innovation Through Dissemination and Utilization of Knowledge, Chapter Eight, *passim*.)

as well. Thelma Freides, for example, distinguishes a whole class of writings in social science as "popular literature," in which the social commentator tries "to persuade his readers to his point of view and influence their attitudes regarding the issue in question and what should be done about it."[5]

What are the consequences of the preceeding considerations? Unfortunately, I think they diminish the generality of both my own theory and that of Havelock. For they show that applied research and development does not always intervene between theory and practice, and they hint that the user and the practitioner are not always separate, as for example in the case of numerous self-help books in the popular literature of psychology. However, since my purpose is not to construct an absolutely general theory of how society uses science and research, these considerations vitiate neither my theory nor the value of Havelock's analysis. Applied research and development does not always have to enter as the link between theorist and consumer, but it does so often enough to merit attention.

Another consequence of Havelock's characterization of the pure scientist ties in with a point that emerged in my brief comparison of physical science and social service information. Both kinds of information include communications from one person to another, but only social service is centrally concerned with messages about people. Social service information may well include answers to questions like "What is progress?" "What is well-being?" In the light of this insight I wish to point out a very important fact: information service to the disadvantaged should not be characterized as merely providing information to the "informationally deprived." The experience of my volunteer work confirms what I have heard from the representatives of community service organizations and interns who worked for them: some of the most important information which community organizations handle is not directed to disadvantaged people; rather, it is about them and is directed to the organization or to the rest of society.

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[5] T. Freides, Literature and Bibliography of the Social Sciences (Los Angeles: Melville Publishing Co., 1973) 3. See also n. 7.

Structure of Social Service Information

So far I have elaborated a theory of the "information structure" of the Technical Information Center, and I have compared my findings with a more general model by Ronald Havelock. Now I must deal with the question: What is the structure of social service information?

Let us return to the two theories elaborated earlier in this chapter. They are in a way similar to a social service planning model. Consider the very CIPP framework according to which I am writing this thesis and which is frequently used by the U.S. Office of Education to evaluate programs.[6]

Havelock's basic researcher is supposed to be a generalist, to look at the broadest context (C), to decide what is known and unknown, to argue basic goals and objectives. My "scientist" is concerned with what exists. Havelock's applied research and development worker contributes possible inputs (I) in the form of designs and prototypes. My "engineer" is concerned with how to design and produce things. The practitioner, in Havelock's view, actually implements a process (P) that creates goods and services. My "businessman" is concerned with running the production machinery. Finally, Havelock's user evaluates the product (P) in his feedback. There is no counterpart in my theory because the comments and complaints of O-I's ultimate users, consumers of their products, did not flow through the Technical Information Center. The parallel begins to break down in another way, too, for the CIPP model does not contemplate separate agents evaluating context, input, process and product.

Here I am nearing philosophical quicksand. The foregoing considerations suggest a general theory of four types of information. To avoid getting bogged down, I do not propose this theory as absolutely general; I only intend to synthesize what the other three theories seem to have in common.

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[6] Leadership Training Institute, School of Library Science, Florida State University, Planning and Evaluating Library Training Programs: A Guide For Library Leaders, Staffs and Advisory Groups (Tallahassee: Florida State University, School of Library Science, 1973).

When one surveys the context (C) to determine what is and is not known, what is and is not a problem, the result is a view of the world, or to use a word derived from the Greek and meaning the same thing, a theory. I prefer the word "view" for the social service context because science is not the only source. Philosophy, history, literature, religion all create views of human society and its difficulties.

When one takes the problems and the theories, the view, and tries to determine everything that could be done to solve problems or remedy evils, the result is a set of plans (or inputs I). Choosing one of these plans one puts it into action (or process P) by issuing commands. But how does one know that the commands are carried out and that the plans and views are valid? This type of information is clearly analogous to the feedback of Havelock's user or the evaluation of the product in CIPP. One could call this type of information uninterpreted matter of fact, observation, sense datum or (translating the Latin root) feeling. I will use the term sense datum. I wish to stress that this is the sort of information one expects to be incontrovertable. Few people, for example, would say census statistics are numerically wrong, while they might easily quarrel with the interpretation put on them or the criterion used for counting.

I will call the generalization I have just elaborated VPCS after the initial letters of view, plan, command, sense data. Remember that VPCS consolidates my description of science, engineering, and business, Havelock's theory and the CIPP model.[7] If the reader understands how such generalizations work, he will realize that I have set up an analogy. What one scheme asserts of one of its parts is a clue to what to suspect of the corresponding part in another scheme. Table 2 should aid in visualizing parallels. Instead of belaboring this analogy and making all its implications explicit, I will discuss two applications of the VPCS scheme, which are, I think, unique to it.

Potential Applications

What are the relationships between views, plans, commands and sense data? Which kinds of information go into the genesis of another? These questions have practical merit, but I will not attempt to answer them in general, because I think the information specialist has to judge in each case which relationships exist and which ought to exist and how strong each is, or

TABLE 2

FOUR TYPOLOGIES OF INFORMATION COMPARED

Terbille	Havelock	CIPP	VPCS
Science	Basic science	Evaluation of context	Views
Engineering	Applied research and development	E. of inputs	Plans
Business	Practice knowledge	E. of process	Commands
---	User feedback	E. of product	Sense data

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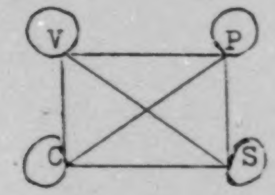
[7] About a month after I finished the foregoing VCPS theory, I discovered Leonard Reissman's book The Urban Process in which the author proposes a four part typology of urban studies. As he says, it organizes a rather large and varied literature and it is in some respects similar to mine. See L. Reissman, The Urban Process: Cities in Industrial Societies (New York: The Free Press, 1970) 26.

DIAGRAM 2
RELATIONSHIPS IN VPCS EXHIBITED BY GRAPH THEORY



Transfer into

Transfer From	V	P	C	S
V				
P				
C				
S				

Matrix

in the case where communications between various agents are involved, which channels exist and which ought to exist and what the volume of messages in each channel is and what it ought to be. To put it another way, it is easy to exhibit all the possible relationships using graph theory. (See Diagram 2) The information specialist, however, must assign values to the matrix associated with the graph. Someone more experienced in mathematics could no doubt productively apply the theory of flow in networks or of Markov processes to the basic graph.

The network of relationships or channels is one application of VPCS. A second application plays on the fact that any single document may contain all the elements of views, plans, commands and sense data, which could be used separately. In addition, the needs of different individuals and different organizations will be characterized by emphasis on different elements. The person who patronizes an information and referral agency usually wants the directions, "If red light number three goes on, shut off switch number five." The person who patronizes a technical information center or its equivalent in the area of social service may desire a theoretical explanation of the workings of the machine. He will be able to decide for himself what to do when red light number three goes on. But is it always possible for the patron of the information and referral agency to avoid tackling theories or views?

This last question raises a very important issue. In thinking about the ideal social service information system we may unwittingly construct the ideal tyranny. Our traditions cherish freedom of views (be they religious, political, or scientific). We reject the absolute right of the state or any individual to command another (slavery and totalitarian dictatorship). We limit access to sense data (invasion of privacy by spying). Clearly we must resist Big Brother's plan when we dream of the ideal information service. This may mean that the ideal social service information system is impossible.

Example of Housing Problems

To illustrate VPCS let us consider the subject of housing. What does one expect people to complain about? Deteriorating, unsafe or unhealthy quarters, the class (and race) of the neighbors, and the cost. Plans and commands would be the sort of information needed to solve these problems as stated. More appropriations (=commands) to pay more inspectors so they could enforce housing codes more strictly, plans for racial integration (or segregation depending on one's goals), plans for tenant unions, etc. To monitor such plans and commands there would be sense data. Pictures documenting unhealthy conditions, statistics recording racial mix, interviews proving that a certain bank is "red-lining" a neighborhood.

Only a few less vociferous souls would be interested in views about housing: What is housing? What benefits does one expect to get out of a dwelling? Why do people with a similar style of life tend to live in the same neighborhood? Many people would dismiss such questions as irrelevant. Yet the answers constitute the rules according to which the game is played. How, for example, can one know whether one is paying too much for an apartment unless one knows rather clearly what benefits one is trying to obtain and what alternative means there are to attain them?

Moreover, an examination of such philosophical issues opens the possibility of fundamental social change. Indeed, in so far as social change means a change in prevalent attitudes, norms, habits and institutions, social change is largely a change in views. Thus an examination of housing arrangements could eventually lead to the formation of communes or a return to the extended family. All the views I have mentioned so far have to do with human nature and so with cultural and individual norms. These norms are double edged. On the one hand they are subjective, vague, and capricious. On the other hand, we can know objectively that norms exist, that they conflict, and that they influence actions. Were it impossible to know these things, there would be neither social science, nor history, nor philosophy, nor literature.

Views having to do with human nature are one large class. There is another large class of views having to do with non-human nature. These views or scientific theories would address questions such as the following. Are polyvinylchloride sewer pipes dangerous? What are the breeding habits of rats? What is the nature of wood; how can it be kept from splitting; can it be made fireproof? Such questions are related to plans for exterminating rats and building houses. Notice that neither the home buyer nor the plumber would want to know much about polyvinylchloride. They would leave it to the builder to worry about scientific information.

Summary

At the beginning of this chapter I raised the question: How does the scientific and technical information used by an industrial research facility compare with the social service information used by a community? I briefly compared an industrial technical information center with a community organization, and I found that there were marked differences; I briefly compared the subject of the two kinds of information, and again I found there were differences. Then I attempted to reconcile the differences by showing that the structure of the information in both places was similar.

I theorized that the Technical Information Center handled three broad categories of information pertaining respectively to science, engineering, and business. Next, I reviewed the more general model of Ronald Havelock. In the course of this discussion I pointed out that social service information is usually about persons as well as to and from them. Integrating my description of science, engineering, and business with Havelock's theory and the so-called CIPP model, I hypothesized that there are four types of social service information (VPCS) views, plans, commands, and sense data. Next, I stated that the relationships between these elements are complex and specific to the particular situation, and that different people require a different mix of the elements. Finally I tried to illustrate VPCS with an example.

Closing Word: Technical Information v. Community Information Again

In closing I must return to the question which I raised at the beginning of the chapter. I said there that the appropriateness of an internship at O-I was justified by postulating that one could learn principles of information work in the technical information center of a profit making organization which would apply as well in an nonprofit social service organization. Has the postulate been vindicated? Did I learn such principles and do they apply? The answer is at best ambiguous.

On the one hand, I have elaborated the VPCS scheme to show that the information structure of the two sorts of organizations can be compared. But on the other hand, I am not at all sure that the difference between the two subjects, between science and human nature, does not outweigh any structural similarities.

The people who make decisions at O-I make them on the basis of scientific information and also the criteria and assumptions of a free industrial business enterprise. Since my internship was in a technical information center, it emphasized the former at the expense of the latter. I cannot emphasize strongly enough that there are important differences between information about physical nature and information about human nature. If the outside scientific community were to destroy totally an O-I researcher's pet theory, the management and the company as a whole would not refuse to learn from the outside scientific community. But if someone provided information to the management which called into question the central tenents of its business philosophy or policy, the information would most probably be ignored and the person or anyone who accepted the "heretical" information would be treated with suspicion.

In an industrial business, then, there are really two sets of views: those concerning physical nature (technical inputs) and those concerning human nature, i.e. the purposes and values of the company (management criteria). In a social service organization there will usually be only one set of views: those concerning human nature.

Perhaps I can make this distinction and its implications clearer to some readers by applying the terms of Eric Berne's group dynamics.[8] The group activity of a technical research facility is concerned with the group activity of society as a whole. The sort of information it handles, therefore, emphasizes the "Adult" rational, technical culture. But the group activity of a community social service organization is by definition concerned to some extent with the group process of society as a whole. The sort of information it handles, therefore, emphasizes the other two elements of the group culture--the "Parental," traditional, moralistic group etiquette, and the "Childlike," innovative, playful group character--as well as the rest of the group canon--the group constitution and laws. But what happens if outside information conflicts with the etiquette, character, constitution or laws of the community organization itself? Consider the following example.

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[8] E. Berne, The Structure and Dynamics of Organizations and Groups (New York: Ballantine Books, 1973) 147-155.

If for some reason an information specialist furnished to the Catholic Office of Community Relations an article in which a Catholic theologian did not unequivocally denounce "abortion on demand," the article would probably either be promptly filed in the waste basket or studied for ways to refute it. I am very sure, at least, that the Office would not oppose the bishop on that issue. Now the reader may dismiss this example: "Oh, that's just the conservative, authoritarian Catholic Church." On the contrary, everyone has axioms, even New Deal Democrats.

Further reflection shows that leaders generally reject information which would overturn the criteria by which they make decisions and gather facts, i.e. which conflicts with their fundamental personal views and those of their respective groups. To question these things is an act of self-doubt and vacillation. The leader who indulges in these acts will not remain a leader for long.

CHAPTER THREE

THE ENVIRONMENT OF THE OWENS-ILLINOIS TECHNICAL INFORMATION CENTER: PEOPLE BEHIND THE POSITIONS

Introduction

In the first two chapters I have covered the functions and facilities of the Technical Information Center, and the structure of the information which it handled. In the present chapter I must say something about the people behind the positions because they undoubtedly affect the way an organization works. Since I will ultimately describe a class in which I attempted to teach certain staff members how better to search for information, it will be convenient to include in my account both the people whom I helped to do searches before I taught this class and the people who actually participated in the class. I must also consider the way that I fit into the group. Since the TIC staff thought of me as a computer expert, it will be necessary to discuss their attitudes towards computers, too. Finally, I must address the question: Did the people who worked in the Technical Information Center display talents, attitudes and qualities different from those I would expect to find in a community social service organization? I will defend the subjective nature of many of my remarks on the ground that even if my perceptions of things turn out to have been inaccurate, nevertheless, I had to act on them.

The People at the TIC

Jack Ormond, the Director of the Technical Information Center was a very practical down to earth man, not at all fancy or formal. I do not mean to imply that he could not be shrewd or subtle. He had studied Industrial Engineering at Purdue and Business Administration at the University of Illinois, and had earned master's degrees in both fields. He was always very proud of his work and of the technological accomplishments of Owens-Illinois. In the morning staff meetings he would often draw pictures on the blackboard to explain the latest "gizzie" or even bring in a sample of one. Like most good executives he was decisive and aggressive. Probably because of these traits he seemed to be under a great deal of pressure. But he knew how to give responsibility as well as accept it. Thus one of his distinctive gestures was to look a person in the eye, point his finger at him and say, "Why don't you take care of that?" This does not mean, however, that he was not concerned about the welfare of his people. I can testify from personal experience that he negotiated an unexpected research grant for me.

Jack Ormond's "right hand man" for planning was a woman: Kaye Soka. "Kaye is interested in doing things systematically." Jack once told me. She was the one who conducted statistical studies relating to various library operations (requests stemming from the Technical Library Bulletin, for instance). She also planned and systematized the routine activities of the library staff. Then, too, Kaye was the person most interested in using computers for library tasks. If you consider all these things and the fact that she was Information Representative for management clients in the corporate headquarters (as opposed to technical clients in the Tech Center), you will not be surprised to learn that she was promoted to the position of systems analyst and moved to the corporate headquarters late in the summer of 1974.

All these facts combined to give Kaye a reputation for being cold, distant and unfeminine--sort of a WAC drill sergeant. But such an appraisal would be grossly unfair. I think Kaye was merely caught in the dilemma which most ambitious women face: they may have either their "feminine" identity or a manager's job, but not both. For the behavior expected of the ideal manager has always been "male" through and through.

If the whole of the TIC staff were as sober and responsible as Kaye and Jack Ormond, everyone would soon go to pieces under the strain. Some human and comic relief was needed. And it came in the person of Ted LeSueur. Ted was Information Representative for the Lily Division and for some people in the Diga-Vue development project. Before coming to the TIC he had worked in the labs and shops of the Tech Center while earning his degree in Business Administration at the University of Toledo. He quickly became expert in using the business-oriented computerized data bases of Lockheed Inc. Thus Ted contributed a good deal of technical background to the staff, but that was not what people remembered him for. A blithe and playful spirit he was forever teasing the younger women in the office. He also took it upon himself to see that everyone received a suitable nickname. In sum, Ted was a humanizing and cohesive force.

"Bubbles" was Ted's nickname for Jack Henry. Jack was short and stout, and, due to a circulatory condition, had a ruddy complexion and a hoarse voice. He had been with the Technical Information Center before it merged with the library and had helped to develop the system for indexing company records. By training, however, he was a chemical engineer. Although he had not done any "hands on" work in chemical engineering for some years, he was extremely well versed in plastics technology and served as Information Representative for those in the Tech Center and at the Dura Center who needed information in this field. In temperament, Jack Ormond and Jack Henry seemed to me somewhat similar, but the latter was more easy going, probably because he was under less pressure from the top.

Alex Hochstein differed from everyone previously mentioned in that he was a thoroughly European man. A native of Hungary, he had studied at the University of Vienna and worked in Egypt. His repetoire of languages, in keeping with his career, included Hungarian, German, Italian, French, and Arabic. With all these languages one might expect Alex to be loquacious. In fact, he was alternately silent and talkative. Although he served as Information Representative for researchers interested in lasers, electronic display panels, and energy, his interest in science was truly catholic. At one time or another he called my attention to articles on the dangers of Eschia coli mutations, the prevalence of sugar in the American diet, fire prevention, and computer aided design.

George Brookover sat at the desk next to Alex Hochstein's. George served as Information Representative for nearly everyone concerned with glass technology. This included operating manufacturing divisions in Vineland (New Jersey), Columbus, and Toledo (Libbey), as well as research groups at the Tech Center. It was convenient for George to have clients whom he could best contact by telephone since he had injured his hip in an auto accident and had to walk with crutches. He also had to keep an electric space heater at his desk during colder weather. George had learned to adapt so well that one tended to forget to make a few common sense allowances. I, at least, had to remind myself not to suggest to him search strategies which required moving all over the Technical Information Center.

Because George had been manager of the Columbus television tube bulb plant, he was familiar with many of the O-I experts in glass technology. He knew well how to cultivate people as sources of information, as he always seemed to have a cheery smile and a kind word for everyone. He was also very patient especially in dealing with computers. His patience, like Ted LeSueur's humor relieved some of the pressure of the TIC.

Like George, Joyce Schifferly always seemed to have a smile and a kind word for everyone. Unlike most of the male Information Analysts, Joyce did not have an advanced "hard science" technical background. This fact had an advantage and a disadvantage. The disadvantage was that her opinion and advice tended to carry less weight. The advantage was that she was more approachable. The people in the office naturally tended to turn to her with the problems they encountered in their work. Thus her feminine style of leadership differed markedly from that of Jack Ormond and noticeably from that of Kaye Soka.

According to the organization chart Ray Downs belonged to the Patent Department rather than the Technical Information Center. But his activities with that department were very similar to those of an Information Representative-Analyst. Moreover his desk was located in an isolated alcove in the TIC, not in the Patent Department on the next floor of the building. Also, since he held a Ph.D. in Chemistry and had done research for O-I before he came to the Patent Department, he knew many of the researchers in the Tech Center and he tried to keep apprised, at least in a general way, of their research activities. In addition, his work on patents required him to become more of a generalist in science. Following this propensity he naturally became proficient in using computerized data bases within a short time.

In manner he was soft spoken and relaxed, yet he could be and was aggressive and decisive. I found that his scientific training led him to be open-minded and to adopt a broad perspective where others might be reluctant to do so.

I always associated Frances Spring with Ray Downs, because the three of us worked together closely on several long searches. Since chemistry was one of the subjects she had concentrated on in college, she had some technical background. Although she had taken courses in Library Science at the University of Illinois and the University of Toledo, she did not hold a library degree. Some of us had come to the conclusion that she was feeling lonely and alienated from the rest of the staff and so depressed. Aside from her personal experiences, there were, as I have explained before, factors in the very floor plan of the TIC which could contribute to such feelings.

An additional source of alienation was probably Frances' interest in environmental causes and consumerism. The TIC was never the sort of organization where the management dictated what employees were to think about public policies. Yet once or twice when Frances mentioned environmental or consumer issues in the staff meeting, I sensed that she felt rejected by some of the other members of the staff because of her views. Actually, several people shared her views and supported her on occasion. It was probably a feeling of inferiority in technical matters which crystalized her distress.

Jeanie Spang was a graduate of the Library Science program at Bowling Green State University. Before coming to the TIC, she had worked in a school library and in the History-Travel-Biography Department of the Toledo Public Library. Jeanie's usually jovial disposition and her unique way of expressing herself tended to enliven any group she was with. When I later began planning to teach a course I knew beforehand that she would not be present for most of my classes since she was scheduled for a leave and an operation.

Jeanne Palmer was a product of the University of Toledo Community Information Specialist program. She had worked as an intern and as a part-time cataloger for the Dana Corporation College Library. Though hard working and helpful, Jeanne had a calm, easy-going temperament that made it a pleasure to deal with her.

Pat Santoro joined the staff of the Technical Information Center toward the end of January 1975. She had begun working for O-I as a secretary in the International Division. Then she had quit and moved to Venezuela for a while. Upon returning she again joined the International Division. She had transferred to the TIC for at least two reasons. First, she found the atmosphere of the Tech Center more relaxed than that of the corporate headquarters. And second, she wanted to do something besides secretarial work. Since she was experienced in translating Spanish and Italian, Jack Ormond thought there would be opportunities for her to translate and interpret. He also suggested that she could take the course I was teaching, probably with the idea of making her an Information Representative. Perhaps the most valuable skill she contributed to the TIC was the ability, which she had gained as an executive secretary, to handle people, especially high ranking people.

How Did I Fit In?

My discussion of the people of the Technical Information Center would not be complete without a section about the way I fit into the group. To put it another way, I have recorded how I perceived the other members of the staff, but how did they perceive me? My data are again mostly subjective impressions and I will again defend them for the same reason: they were all I had to act on.

"We had our job to do and we did it." Although Jack Henry said it in entirely different context, this saying always epitomized for me the atmosphere of the TIC. My perception of things is naturally much sharper in retrospect, but from the start I must have had an inarticulate feeling that if I tried to find out what I could do to help the people at the Technical Information Center and did it, they would accept and respect me. In other words I felt they were "task oriented."

I soon sensed that one of the ways I could be helpful was by learning how to use the computerized data bases proficiently. I also thought that in learning I would be taking advantage of a unique opportunity of my internship. During my first few days at the Technical Information Center, Kaye Soka showed me how to access the System Development Corporation data bases. The next morning Jack Ormond querried me in the staff meeting somewhat as follows:

Jack: Well, Chuck, did you get on the terminal yet?

Chuck: Yes.

Jack: Did you have any trouble?

Chuck: No.

Jack: See, you guys. He comes here two days and he's already using the thing. Why don't you?

This last remark, directed at the rest of the staff present in the meeting both gave me a signal and raised a couple of questions.

The signal was that I should develop my skill in using the computer and try to introduce the rest of the staff to it. I did this in a very informal way. The first few times I tried to access SDC without Kaye Soka looking over my shoulder, I messed up the sign on procedure. To make matters worse, a couple of these times I was working with Frances Spring who was trying to overcome her fear of computers. (In the beginning, I liked to have one of the permanent staff members with me to make the long distance call to Santa Monica on the O-I leased line, since I did not as yet feel fully endowed with bureaucratic authority). At any rate, after fumbling around a few times I diagnosed my initial mistakes and did become proficient in using the computer. Later, toward the end of July 1974, I consolidated my learning in a little hand-out sheet "How to get on the SDC data bases." (See Appendix I) Using this as a text, I took one Information Analyst after another to the terminal and coached him.

I said before that Jack Ormond's remark not only gave me a signal to become a computer coach, but also raised two questions. The first was: Why did he think I should become a computer expert? One answer was that my very first day, when I was being introduced to the staff, I had mentioned that I dealt with computer tapes in connection with my volunteer work. I suspect also, that Miles Martin, the chairman of my department and a good friend of Jack, may have said something about the familiarity with computers which I showed in a course on library automation. Another factor was probably my Ph.D. in Classics. Although I usually did not advertise my degree, Jack had mentioned it in introducing me. I think my degree meant to Jack that I had done some advanced work in some field and that I had some kind of skill in mastering something complicated. In other words, I must have some kind of smarts.

I wish to digress briefly about the attitudes concerning my Ph.D. I usually do not trumpet my title, not only because, as one staff member once noted "You're so quiet," but because it tends to intimidate people and cause them to reject me. The expression "pointy-headed professors" illustrates this attitude. I cannot recall any concrete evidence that my colleagues at the TIC held such an attitude, but I was always a little suspicious and fearful that it might develop. On the contrary, some at O-I seemed to treat my title with adulation and in their tone of voice almost conferred omniscience on me. I did not welcome this attitude either. Fortunately, a third attitude seemed to be most prevalent, especially as the members of the staff learned what I could and could not do. This attitude surfaced most often when an Information Representative introduced me to one of his clients. (The client was usually himself a Ph.D.) The Information Representative would emphasize the fact that I was helping with searches at the TIC with a tonal quality that could be interpreted as a vote of confidence. He would mention my degree as a point of common interest as if to say, "You're a Ph.D. and so is he." By the time I left the Technical Information Center, Alex Hochstein was introducing me by saying, "If you ever see him around when you need information, grab him quick."

Attitudes Toward Computers

I have digressed from a discussion of two questions which one of Jack Ormond's remarks raised. The second question was the one Jack himself was asking. Why didn't the staff use the terminal more often? There seemed to be several ready answers. First, Kaye Soka was the resident expert and it seemed wise to leave the use of a complicated and costly system to the expert. Second, computers are always a bit frightening or frustrating for the beginner, and it takes time to learn to use them well. If there was anything the staff of the TIC did not need it was more nervous tension or another activity demanding their time. Finally, there was the reason I deduced from the behavior of Jack Henry.

As I have said earlier, Jack Henry was with the original Technical Information Center and helped to develop the computerized retrieval system for internal reports. When I learned this fact I was surprised that he was not especially inclined to favor the computer. This impressed me all the more because I worked closely with Jack during my first days at the TIC. I do not mean that Jack was reluctant to use the computer, but rather that he was very level headed in assessing what results to expect from the machine. He was well aware that there were often several ways to achieve desired results, the computer being only one. Besides the saying about doing the job which I quoted earlier, I remember him for telling me, "Do it any way you want." I thought Jack Henry's attitude was very wise and tried to adopt it for my own.

Jack Ormond, on the other hand, had good and equally wise reasons for favoring the use of the computer. The data bases were new tools and he was eager to have searchers use them frequently enough so that he could determine what effects they would have on the performance of the entire department, (i.e. saving of time, added costs). Ultimately, he would have to decide whether these effects justified the services of SDC and Lockheed. He might also have to compare new data bases and decide whether to subscribe to them.

TIC People v. Community Organization People

I think it will be appropriate to sum up what has emerged in the discussion of individual people. First, we have seen that the staff of the Technical Information Center taken together possessed a remarkable range of formal training and informal experience both in library service and in technical fields. It would be difficult for anyone to teach the group as a whole something which one individual or another did not already know. Second, the degree of nervous tension in the TIC was apparently not as high as it was in the corporate headquarters, yet it was a factor that had to be watched carefully. Third, the roles in the organization tended to exhibit traditional sexual stereotyping. Secretaries and librarians were female; managers and technical experts (with a couple of important exceptions) were male. Fourth, informal arrangements, "traditions" which the staff had invented and preserved, as well as formal arrangements like organization charts and job descriptions, determined the way the group worked. Finally, with respect to those ikons of modern technology, computers, those who best knew the machines regarded them neither as magical fetishes capable of solving all problems, nor as demons to be shunned, but rather as ordinary tools to be employed with sober judgement.

In Chapter Two I took the Technical Information Center as an example of a certain kind of organization, a profit making enterprise oriented toward technology, and compared it with a nonprofit community social service organization. After the preceding discussion the reader may wonder whether the inhabitants of the two sorts of environments would differ. This question is difficult for me to answer. I cannot use the Office of Community Relations of the Catholic Diocese of Toledo for a corresponding example as I did in Chapter Two, because I spent far less time there than I did at O-I, and so did not get to know the staff so thoroughly. In addition, the term "community organization" could apply to anything from the local neighborhood residents' association, to the artists' club, to an office of the Model Cities Program. The people attracted to these groups vary greatly.

Despite all these drawbacks, it is clear from the definition of a nonprofit organization that the calculus of profit does not or should not motivate people to join it. Furthermore, since community groups aim primarily to solve human problems, not physical or mechanical ones, their members ought to be more interested in the former than in the latter. In fact, these groups generally promote some value which is not a matter exclusively of logic and rationality: social justice, compassion, rehabilitation of criminals, amelioration of poverty, enjoyment of beauty. Now in so far as the people who join these organizations must apprehend these values, they are not acting from strictly rational, logical, utilitarian motives. This agrees with what I said about the group dynamics of community organizations. (Incidentally one might suspect that the methods of humanities disciplines would be well suited to deal with the values mentioned here. This is a topic for another essay).

It does not follow from the preceding observations that the leaders of community organizations are bereft of logic and rationality while industrial researchers are bereft of ethical and esthetic values. This is handily shown by the example of Mike Fein, who is both an O-I researcher (two Ph.D's, Physics and Engineering) and a leader of a community group called the New City Coalition. But the comparison of the people who belong to the two sorts of groups can be put in these terms: a rational analytical mind and technical training are the chief criteria for admission to a research center; concern for certain values and the ability to deal with people seem to be the criteria for admission to a community organization. Other qualifications besides the ones demanded by the chief criteria do count, but they are secondary.

What does all this mean for the information specialist? Research scientists generally appreciate the value of scientific literature, and they are accustomed to defining their problems very clearly. In members of community organizations these two traits cannot be taken for granted. They may have to be convinced that written documents, especially books, with or without tips from insiders and statistics, can help them, and that they will have to define their problems if they expect anyone to provide information for their solution.

I will not attempt to compare the people in the TIC with those in a community organization in any other ways. I suspect, however, that given any specific example to make such a comparison marked differences would appear between the two groups.

Summary

In this chapter I have given a brief description of certain individuals who worked at the Owens-Illinois Technical Information Center, myself included. As part of this description I discussed varying attitudes toward computers. Finally, I compared, as best I could, the inhabitants of an industrial research center with members of community social service organizations.

CHAPTER FOUR

PROJECTS CONSIDERED, PLANNED, AND UNDERTAKEN

Introduction

In the first three chapters I described the situation at the Technical Information Center as I found it. In the present chapter I will describe the activities that I could have undertaken, those I planned to undertake, and some I actually did undertake with rather disappointing results. There are four main episodes: the cost effectiveness study, the development of improved search aids, the development of a model for the search procedure, and the evolution of the staff improvement course.

Cost Effectiveness Study Rejected

When I first learned that I would be doing my internship at the Technical Information Center, I imagined that it was a very cost conscious place. Thus at one point in my course in library administration I made a special effort to study various aspects of cost analysis. This concern turned out to be exaggerated.

Jack Ormond was not penny wise and pound foolish. I think he realized very well that when someone imposes financial control which is too tight he creates tension and anxiety, if not downright hostility, among the people controlled. Such control might work well enough for the supervisor of a production line or a sales office, but it would not work well for a technical information center. I recall that Jack once said in connection with expensive computer time, "We want you to take the time and the resources you need to get the job done right." Thus he seemed to feel his role was exactly what his title indicated: he was a director who promoted and harmonized the skills of his talented employees and not an overseer who told them how to handle very last detail.

Jack's attitude extended also to the users of the Technical Information Center. He did not levy costs on each search but instead he periodically negotiated cross charges with the head of each department that was served. In my opinion this was a wise approach for two reasons. First, it is always difficult to estimate the value of information in dollars, so how could the users know whether they were obtaining exactly their money's worth? Second, it could easily happen that the project which could least afford heavy costs could benefit the most from the services of the TIC. To cut off these services would be to promote the interest of the more prosperous parts of the corporation to the possible detriment of the whole.

The foregoing paragraphs should not be interpreted to mean that Jack Ormond was not interested in holding down costs. He was always studying the operations of the Technical Information Center with a view to streamlining them. For this reason, and also because library science literature had not discussed the matter at any great length, I toyed with the idea of comparing computer searches with manual searches from the point of view of cost efficiency and effectiveness. Ultimately, however, I decided to abandon this idea. Two considerations led me to this conclusion.

Early in June 1974 I had begun, on my own time, to investigate the recent library science literature relating to the searching of computerized bibliographies. Some of the first articles I read were one long equation in statistical decision theory or probability. I refer the curious reader to the following examples:

A. Bookstein, "Statistical behavior of search keys," Journal of Library Automation 6:109-116 (June 1973).

J. Miker and others, "The Maryland refutation proof procedure," ED 072 817.

J. M. Tague, "Bayesian approach to interactive retrieval," Information Storage and Retrieval 9:129-142 (March 1972).

Since I had not been trained in statistics and probability, I wanted to steer clear of any project which would require that I understand such articles.

But I had not yet given up the idea of studying costs. After all, I reasoned, I might be able to avoid higher mathematics and put the problem in a simple accounting equation. Yet I had learned in my course in library administration to be skeptical of the value of cost analyses. I had discovered a Rand Corporation analysis of the Beverly Hills Public

Library which I had shown to Doug Zweizig who was teaching the course.[1] He was not enthusiastic about the study and he was especially cool toward the grand systems analysis equations which purported to be a mathematical model of the operations of the library. He raised the issue of efficiency versus effectiveness. For example, the Beverly Hills Public Library may have circulated so many books but to what extent did circulating them accomplish the broader purposes of the library, such as furthering the education of the community? In a similar way the TIC might be efficient in carrying out the activities which it planned, but these activities might not be effective in accomplishing the desired purpose.

Notwithstanding these misgivings, some time after July 15, 1974 I sat down and tried to come up with cost formulas to compare computer searches with manual ones. I soon ran into practical problems. First of all, I would have to find a way to allot the initial cost and maintenance of printed materials to contemporary units of time. To illustrate this, consider a volume of Chemical Abstracts printed in 1950. If I were to accept a fundamental accounting principle, I should match the costs of acquiring and maintaining an asset with the benefits derived from it. So the cost to a search in 1974 should include some fraction of the original price of the 1950 volume, of the costs incurred in 1951 to bind it, and of the costs incurred in providing space to store the book for 25 years. But what fraction? If one could set a "useful life" for this "asset" one could produce a schedule of depreciation. But what is the useful life of information?

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[1] J.P. Newhouse and A.J. Alexander, An Economic Analysis of Public Library Services (Lexington, Massachusetts: Lexington Books, 1972).

There was a further problem in that the computerized data bases did not cover very many publications over five years old. On the other hand the TIC did not have printed sources comparable to most of the data bases. But to compare searches comparable sources are required. Finally, there was no way to estimate the value of serendipity. In printed sources searchers chanced upon material unrelated to what they had set out to find but valuable for some other search, perhaps even for some other searcher. This happened often enough that it would have to be taken into account. But how?

Faced with these problems and remembering Doug Zweizig's attitude I decided to abandon my attempt to deal with comparative cost efficiency and effectiveness. I consoled myself by recalling that research and development costs such as the ones I was dealing with present some of the most troublesome problems to accountants.

New Search Aids

Toward the middle of July 1974, after I had discovered the statistical style of the current literature on computer efficiency, I felt somewhat frustrated. I had spent quite a few evenings in Carlson Library doing a literature search and reading articles, when I would have preferred to have been enjoying myself with my friends. Nevertheless, since

I was busy enough with searches at TIC so that I could not get over to Carlson Library during the day, I dutifully trudged over at night. In addition I was still half expecting Kaye Soka or Jack Ormond to present me with a detailed description of my project like the one they had drawn up for our previous intern Marge Perry. But on the other hand I thought I should be defining my own project. I realized that such a feeling of ambiguity would be about normal at this point in an internship. It seemed that my work as a literature searcher was helpful to the people at TIC and I wanted to curtail outside work as much as possible. Therefore, I decided to look for ways to improve the art of searching which I practiced every day.

At this point I must mention the materials that were given to me when I began my internship. They consisted of a copy of an article by Alfred A. Beltran, "The craft of literature searching," Sci-Tech News 25:113-116 (Winter 1971), and Kaye's own contribution entitled "Checklist for searching," which was dated 8/22/73 and which I will later explain in detail. The Information Representatives did not seem to follow very closely the procedure recommended by Beltran. I judged that they had good reasons for not doing so, since very few of the requests they received demanded the thoroughness envisioned by Beltran. As for Kaye's list I found it a useful introduction to the commonly used sources.

Everything I have said so far is an introduction to the question: How did I think their search procedures and search forms could be improved? After analyzing things and sketching several informal models, I came to the following three conclusions.

(1) Although Beltran's article dealt with the topic of request negotiation, not all the Information Representatives were equally adept in uncovering what a requester "really" wanted. Frances Spring in particular had difficulty getting a caller to say over the phone why he needed the information or what he intended to do with it. Then too, Information Representatives generally used clues in the request interview to judge how far they should extend the search into the older literature, and how quickly and in what form they should deliver the results. Also they did not distinguish very clearly between what I would call quick reference questions and extended searches. This distinction was useful because one would try to answer reference questions directly from reference books (like encyclopedias, handbooks, and textbooks) and many essentially similar answers to the same question were not desirable. Extensive searches, on the other hand, would take one into indexes and abstracts and bibliographies (indirect sources of information) where redundancy was expected and accepted.

To remedy these difficulties, then, I constructed an outline of what I called "interview cues" (See Appendix II). I did not intend this outline as a series of questions which the Information Representative would read off in a mechanical fashion. Rather it was a reminder that he could glance at in the course of a conversation to make sure he was not missing some potentially important point. If he could safely assume something, he would not have to ask about it.

Since I have appended this document I will not characterize its physical appearance, but some of the headings may require explanation. I borrowed the concept (but not the term) "perspective" from Vickery.[2] This concept visualized several different classes of scientific and technical information about any given topic. The class or classes the requester desired would depend upon his "perspective," how he intended to use the information, e.g. to develop a new product or to write a theoretical paper.

The heading "form" referred to the fact that sometimes a requester wanted to see a full list of titles before selecting a specific item, while at other times he would leave this to the discretion of the searcher and ask for the text directly. There could, of course, also be other cases where a collection of abstracts or a digest of the literature was wanted. In the event that the requester wanted a text immediately, his request might be considered a reference question, rather than a literature search. The Information Representative might be able to find a chapter in a handbook or special encyclopedia without scouring something like Chemical Abstracts. Hence the line: "Is this really a reference question?"

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[2] B.C. Vickery, Information Systems (Hamden, Connecticut: Archon Books, 1973) 49-50.

What I meant by the "scope" of the request is probably fairly evident. Was the searcher to cover Applied Science and Technology Index back to 1955 or only 1970? Was the topic a rather general one to which an entire book might be devoted or which might be conveniently summarized in an encyclopedia or review article? Or was the information being sought so specific that it would be expressed only in a few sentences in some remote journal article? How many pages was the requester prepared to read? What languages could he manage?

Under the heading "constraints" I included, first, deadlines. This meant that the Information Representative had to know whether the search was to be completed before a certain time. If there were a rush, the search would have to be planned and scheduled accordingly. The next constraint was cost. Because the Technical Information Center and its clients were not willing to expend unlimited sums to discover a given fact, the searcher had to consider how much it would cost to acquire a book, access a data base, etc. Finally, certain searches involved matters which O-I wanted to keep within its own walls. For such searches certain sources of information, e.g. an interlibrary loan, would be undesirable.

These, then, were the "interview cues" I proposed. The second way I proposed to improve the searcher's job was to create a "source array."

(2) Although Kaye Soka had drawn up a very useful checklist of search "tools," I decided it could be improved.

Because she wrote detailed annotations, Kaye apparently intended her list to acquaint the Information Representatives with the sources available to them with which they were not already familiar. I assumed, on the other hand, that they would acquaint themselves with the limitations and advantages of various bibliographical tools by using them.

I saw the need for a written aid to help the Information Representatives remember all the sources. Thus the source array I created was more like the abbreviated list of titles which Kaye had placed on the back of the search report forms. I reasoned that this could be improved upon by organizing it in broad subject categories rather than in alphabetical order by title. I also separated bibliographies which had a closing date from indexes which continually cumulated. In addition I made an effort to record the period of time covered by each item, and for completed bibliographies, the call number, and a note to indicate whether the source contained abstracts or mere references.

So much for the proposal concerning a "source array."

(3) My final suggestion was to provide a search report form that would facilitate work with cumulative indexes. I personally had difficulty remembering which years I had covered if I was interrupted or took a break in the middle of the task. Therefore, I thought it would be beneficial to have a search report form which was lined like graph paper. One could write down the abbreviated title of the index and the key words or headings below it near the left margin. In

the blocks to the right of each keyword one would enter the last two digits (or some other symbol) of each cumulation one intended to examine. As each item was actually examined a check would be made in the box below the digits. Such a procedure would have the side effect of encouraging Information Representatives to plot a search strategy before they executed it. (See Appendix II)

These, then, were my three suggestions to improve the search procedure (1) "interview cues," (2) "source array," and (3) a new search report form. Since Kaye Soka was Group Leader for Systems, I thought it would be appropriate to submit the proposals to her. So I handed her some samples of the proposed new search aids together with the note included in the appendix, on about July 23 or 24, 1974. On August 13 she returned them and commented that I was "on the right track." But in the meantime the nature of the project itself had changed.

Development of a Model of the Search Procedure

Late in July I thought it would be appropriate to consult with my advisor to see whether I was doing acceptable work. It also happened that I had scheduled a meeting with Marge Perry our previous intern and Lou Allen who followed me. This meeting took place about June 23, 1974. I had prepared a four page impressionistic job description for Lou, so I delivered an extra copy to Miles (my advisor; see Appendix III). Miles visited me the morning of July 30.

During this meeting Miles expressed mild dissatisfaction with the job description, examined the new search aids I had proposed and suggested that I develop some new kind of model of the search procedure to accompany them. Both of us met with Jack Ormond to explain what it was I would be trying to do. Two points raised in this meeting were noteworthy. First, Jack apparently had in mind using the model directly in a training course; for him it was not to be a highly technical theory which an instructor would translate into a course. I recall him later saying that it should be something anyone could understand. The second point of note was that when Jack proposed a mathematical model I balked and we reached agreement that literature searching was an art not a science.

I then wrote a four page draft of the informal model I had had in mind all along. The two main parts of this model were (1) a diagram with three amoeba-like figures which supposed to show the searcher as one who translates the language of an information system into that of a user,[3] and (2) an algorithm in outline form setting out an interactive search procedure. I delivered this draft a day or so before our next meeting so that Miles could read it. He phoned me the day before our next meeting to say that he was still not satisfied, especially with the amoebas, and he asked me to try to put the algorithm in the form of a decision tree. I did this and at our meeting we examined it, but Miles rejected it because it had loops which are illegal in decision trees.

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[3] Later I discovered that I had reinvented the model of G. Salton, Automatic Information Organization and Retrieval (New York: McGraw-Hill, 1968) 202 ff.

Towards the end of the meeting he suggested that I should do two things (1) exhibit the steps in the search procedure using PERT or critical path analysis, (2) write a decision rule for all decisions at the nodes. The decision rules, he said, could be expressed in terms of controllable variables and uncontrollable variables or parameters. They would be inequalities of the form:

If $D_{(n)} \geqslant A$, then go (or yes, or Branch 1 etc.)

If $D_{(n)} < A$, then no-go (or no, or Branch 2 etc.)

When Miles asked me whether I thought I could produce such a model I made some ambiguous reply like, "We'll soon find out."

When I started on the new version of the model, I soon discovered that loops were allowed neither in PERT nor in critical path analysis which is a subspecies of PERT. Consequently I resorted to computer programming symbols, because I knew loops were not only permissible there but common. The decision rules kept eluding me. Every time I believed I had isolated all the variables a new one popped up, and as soon as I thought I had fixed the critical value for a rule (A in the inequalities) I would encounter a case where it would result in a decision contrary to my judgement. As a result, when I was ready to discuss the new model it was very messy, consisting of numerous decision rules and at one point a complicated table of values for all the possible cases. (See Appendix V).

Again I met with Miles and again the result was frustrating. Even though Miles was pleased with the new approach, in many instances when we examined a variable closely the model began to fall apart. He advised me to patch up the holes and to write a fuller explanation of the bare symbolic scheme.

By that time I was ready to submit a thesis proposal. Miles envisioned a short paper, thirty to thirty-five pages, along traditional lines. It will not be appropriate here to follow in detail my work on this paper, but it will be appropriate to explain briefly why I dropped the topic. I will list three reasons.

First, I wished from the very outset to avoid mathematics and especially any branch of mathematics, such as probability or statistics, which involved elaborate numerical calculations. Yet I was constantly being pulled in that direction. In my opinion, anyone who wishes to construct a mathematical model which actually promotes understanding of a subject and which does not merely employ equations, matrices, and similar forms as rhetorical ornaments, must have a thorough command of the definitions of fundamental mathematical concepts such as set, function, relation, mapping, ordinal number, cardinal number, etc. I did not have such a command of mathematical fundamentals, and what was worse, I was for the most part prevented from using the methods of which I did have some command, those which I had learned in humanities disciplines. Why, in general, I was prevented from doing has been aptly stated in a paper by Victor Rosenberg on current trends in information science.[4]

My second reason for dropping the model of the search procedure was that, even if decision rules could be written, I felt my model would merely pass on the problem to the person who had to apply it. Perhaps I can illustrate in an example. It is very easy to write a mathematical algorithm for computing the area of a triangle, if one allows the general steps: "Measure base; measure height." But in applying the rule the crucial question is usually: How can the base be measured? Suppose it is about five Ångstroms or five light years or spans a surface full of bumps and holes. In a similar way I was telling the hypothetical searcher: "Determine subject area," when the real question was how to do this.

My third and final reason for dropping this project concerned style. For myself, I wanted the study to probe philosophically into the question: What do we really do when we plan a search strategy? For Miles it had to have a diagram reminiscent of systems analysis and some decision rules. For the people at O-I it had to be down-to-earth and untechnical. When I submitted drafts of the thesis to Doug Zweizig and Sharon Stein (members of my thesis committee) most of their criticisms were to the effect that my writing was incoherent and confusing. Small wonder when I was concerned with being all things to all people!

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[4] V. Rosenberg, "The Scientific Premises of Information Science," Journal of the Society for Information Science 25: 263-269 (July-August, 1974).

So after eight months of struggling with a frustrating task, I decided to give it up.

Evolution of a Staff Improvement Course

Even while I was still laboring over the model of the search procedure, in mid-November, Jack Ormond called my attention to a National Science Foundation solicitation of proposals for research. He wanted to know whether Miles had seen it and whether Miles intended to submit a proposal. I carried a copy of the solicitation to Miles and he said he wanted to talk it over with Jack. All along I was wondering what specific project they would propose, for I knew neither of them had done any research for NSF recently. I presumed NSF would place great emphasis on originality as a criterion for selecting projects to fund.

What they had in mind was to design a course to train technical personnel, like engineers and research chemists, to search for information. Apparently they thought that working in connection with models I had established that there were no such courses. Actually, scientific models and courses of instruction are two widely separated subjects. The usual purpose of a model is to prepare the way for automating a procedure, but it is often a very poor base on which to build a course. At any rate, before we proposed to NSF that we would design a course, I wanted to check what had been done. My literature search revealed that three or four different groups including Lockheed Inc. and Herner and Co.

had developed such courses. Since we were late in getting started and I discovered the existing programs only days before the December 15 deadline, the idea of a proposal was in effect dropped.

During our discussion of the proposal to NSF, I began to suspect that Jack Ormond was really trying to say not "There ought to be a course," but rather, "I need a course for the TIC." My hunch proved correct. Late in December, soon after Frances Spring, the Reference Librarian, had revealed that she intended to retire at the end of January, Jack called Ray Downs, Jack Henry and me into his office. He wanted to ask our advice about several interrelated matters: Should he ask a single person to become an "expert" in using each of the on-line search services (SDC and Lockheed) or even each of the files available within the services? Should he appoint specialists to handle reference questions in specific technical areas? He ultimately decided in favor of experts in each of the two data bases and subject specialists who would answer reference questions and master the vocabulary of information retrieval in their special field.

Then Jack asked whether I would be willing to teach a staff improvement course. At first it was to be limited to the computer data bases, but eventually it encompassed everything the Information Representatives needed to know. Jack said he wanted it to include readings, lectures, homework, actual searches and even exams. I took this statement with the proverbial grain of salt. He meant that he wanted the

Information Representatives to approach the course seriously, and that he wanted them to have a fairly clear idea of their progress.[5] I reserved for myself the right to judge the appropriate teaching methods.[6]

Actual Design of the Course

Although I never wrote specific "behavioral objectives" for the course, I had to have a fairly clear idea of what I was attempting to do. In the first place, I knew very well that I could teach the group as a whole very little. My students were supposed to be Jack Ormond himself, Jack Henry, Ray Downs, Ted LeSueur, Alex Hochstein, George Brookover, Joyce Schifferly, Jeanie Spang, and Jeanne Palmer. Pat Santoro joined after we had started. I felt that nearly every one of these people was as skilled and knowledgeable as I in some aspects of the work of an Information Representative. Accordingly the goal of the course would have to be to round out their skills.

At this point I made a decision of which I was not fully aware. A class, that is the meeting of a group of people for certain educational exercises is only one of several ways to accomplish learning. Yet Jack Ormond had proposed a class. By following his lead I rejected other options. In order to satisfy the varying needs of the students, the objective of the class would have to be to cover every aspect of the Information Representative's work that I knew anything about, and I would have to accept the fact that some of my students would always have a great deal to learn while others would have very little.

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[5] This was very much in keeping with Jack's character as discussed in Chapter Three.

[6] This decision was undoubtedly influenced by my familiarity with J.D. Ingalls, A Trainer's Guide to Andragogy: Its Concepts, Experience and Application (Washington: U.S. Government Printing Office, 1973) sudoc. classification HE 17.8: An 2/973.

Given these assumptions, what were the skills of an Information Representative which I could improve? He had to be able to negotiate requests, to plan a search strategy, to know his sources, to know how to use them, and to think about information.

I translated these fuzzy objectives into a class schedule by considering limitations of time. I did not think it would be advisable to ask the Information Representatives to make time in their already busy schedules for more than one class period a week. But, on the other hand, I did not want to put them all in one large class because I thought smaller classes would be more conducive to learning and participation and because the Information Representatives were at that time taking turns sitting at the reference desk, so that I would always miss someone. Consequently I chose to hold two classes a week repeating the same topic. In effect I had twelve meetings to plan for, one each week of the quarter.

The next thing to decide was: How long should each meeting last? Or to put it a different way: How much time did I think my students would be willing to spend? I judged that an hour would be about the limit, but to be safe I scheduled the meetings from 10:30 to 11:30 (Tuesday and

Thursday) so that I could run a little over if necessary.

My next step was to consider which topics I would emphasize and which I would have to treat in a cursory manner. I made this judgement on the basis of my own estimate of how the staff needed to improve their skills and of Jack Ormond's expressed desire to stress computerized data bases. Now we actually had five different data bases of any consequence: the System Development Corporation and Lockheed time sharing service, two different mechanical apparatus for the Central Document System, and the Melt Data System. I knew very little about the MDS so I planned to skip it. Since Ray Downs and I both agreed that SDC's service and retrieval language were better and since most of the Information Representatives were more familiar with the internal CDS systems than with external services, I decided to concentrate on SDC. I allotted one session for the internal systems and one for external ones other than SDC. Four sessions were then to be devoted to SDC.

There are two "topics" which, in my opinion, every course ought to cover: the introduction and the conclusion. Consequently I set aside all of the last session for a conclusion. Not that I thought I would use the entire time to sum up the course, but I wanted some extra uncommitted time because I had the premonition I would have unfinished business to fill it. I would have spent the entire first session on an overview, but I did not feel I could afford to spare that much time.

At this point I had part of the first session and four others left. In this time I had to cover strategy and some general considerations about information, printed sources for both extended searches and reference questions, people as sources and request negotiation. Extreme brevity inevitable! It would be convenient to combine request negotiation and people as sources. I hoped to be dealing with strategy all along, so I thought I could confine the formal treatment of it to part of the first session. It would also be logical to put the general principles in the beginning.

As I was making all the decisions I am reporting here I was recording them in a draft of a course outline. Since I followed this method I was forced to determine the temporal sequence of the topics. I had placed strategy and general considerations at the beginning. Request negotiation and people as sources would naturally come next because the search starts with the request. Wishing to preserve a balance between computerized sources and printed ones, I chose to deal with print first, and in that way to emphasize it. But I also had a hunch that we might miss some sessions and I wanted to avoid covering SDC retrieval language in an unbroken series of meetings for the sake of the students who were working with computers for the first time. I wanted them to have enough time to digest the basic principles and practice the basic skills. Thus I inserted one session on printed materials and one on other automated systems into the series of meetings dealing with SDC.

I was then left with the problem of how to cover printed sources in three sessions. Since Jack Ormond had decided to formalize existing practice and ask each Information Representative to become familiar with the TIC's reference materials in a certain technical field, I decided to skimp on these sources. Perhaps I would assign them a bibliography as "homework." I had already distinguished static bibliographies from continuing indexes when I constructed the "source array." A distinction between bibliographic tools such as Books in Print which cover publishers' output and those like Chemical Abstracts which attempt to cover a specific subject, might also be useful. If I began by making this distinction I could easily lead into a discussion of the way indexes are made (e.g. use of permuted titles versus broad subject classification). This would in turn allow me to talk about classification schemes and library catalogs.

As a result of all the foregoing ideas, I planned one session on catalogs, classification schemes, the making of indexes, and bibliographic controls at the point of publication, a second session and part of a third on specific continuing indexes and the rest of the third session on closed bibliographies, reference books and printed sources of direct information.

At this point I had a schedule of topics (See Appendix VI) on a sheet of paper that was becoming rather cluttered. So I decided to make a one page outline of each session. In preparing these outlines I began selecting the appropriate means to teach each topic. For I certainly could not lecture all the time and I wanted the students to participate. Another consequence of preparing the outlines was that I was forced to become acquainted with the literature available in the TIC, so that I could distribute reading lists and bibliographies.

When I had completed the outline there was not much time left before January 7, the day the course was due to start. Although I had handout sheets, exercises and lists of readings on paper for many of the sessions, I planned to spend some time each week putting them in final form. I will not describe these detailed plans here, but rather in the next chapter where I will also describe their implementation.

Summary

In this chapter I explained why I decided not to try a cost effectiveness study, how I designed some search aids and how I attempted to provide a model of the search procedure to accompany them, but failed. I also told how the idea of a staff improvement course came to be proposed and how I planned for it.

CHAPTER FIVE

EXECUTION OF THE STAFF IMPROVEMENT COURSE

At the close of the previous chapter I narrated my plans for the staff improvement course. In this chapter I will, to a certain extent, delve into the details of the course content, but my primary purpose is to relate what happened as I actually taught the course. I will recount events in chronological order as nearly as I can.

The course was scheduled to begin January 7, 1975, but it actually began a week later because Jack Ormond and I had forgotten to announce to the staff that they were expected to attend the meetings. When we did meet for the first time Jack Ormond was not present, even though he was supposed to be. Ultimately he did not attend any of the meetings. Had he remained as Director of Technical Information Services his absence would have been truly regrettable. But in the event, he became production manager of a plywood plant owned by O-I, so the loss was less harmful.

The first part of the first session was undoubtedly the most difficult. As I told my students, it would be nice to begin at the beginning, but we were forced to begin in the middle. They were already Information Representatives and good ones. It was my aim to round out their knowledge and skill. After explaining very briefly the overall plan of the course, I launched into a philosophical discussion of certain aspects of information and I prefaced my remarks with some considerations about the role of scientific and technical information in a competitive industrial enterprise. Some of my material was derived from an essay by Kenneth Boulding concerning information as a commodity.[1] Other material comprised the commonplaces of information science.

Without reproducing the lecture here, I will give some examples of the kinds of points I made. There is no acceptable measure of information, so it is sometimes difficult to fix its cost. Some information is valid for only a brief time while other information is ageless. Information is not alienated by transfer the way physical resources are. An overload of information may be as bad as none at all. Although my students seemed at least politely interested in all these points and had evidently not heard some of them before, I still felt rather shaky giving the lecture. I should not have been surprised by the lack of enthusiasm. If the reader recalls the cast of characters in Chapter Three, Ray Downs and Alex Hochstein were the ones who would be expected to be interested in such matters. Consequently I was glad when I came to a class participation exercise.

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[1] K.E. Boulding, "The Economics of Knowledge and the Knowledge of Economics," in The Economics of Information and Knowledge, ed. D.M. Lamberton (Baltimore: Penguin Books, 1971) 21-36; and his "Knowledge as a Commodity," in Beyond Economics (Ann Arbor: University of Michigan Press, 1968) 141-150.

I had made the point that a question implies within itself the form of an acceptable answer.[2] In doing exercises I always tried to explain the ground rules and the purpose of the exercise beforehand. In this case I said that I had invented requests for searches using fictitious technical jargon. I told them the purpose of this oral exercise was to teach that, when they did not understand a technical term, they should not become so flustered that they missed the rest of the sentence. Moreover, they should be able to recognize the form of an acceptable answer. In this exercise, I said, they were supposed to see the proper form of the answer and invent the substance. I even encouraged them to fake the title of a book where they might find the answer. For example, the request might read, "I need to know the mathematical equation which describes a quixotoid." The answer I expected was something like, "I have it here in the Encyclopedia of Odd Mathematical Functions. It's $y=x^{p}+e^{-n}$."

The exercise was not quite as successful as I had hoped. First, the comical nature of some of the terms (e.g. quixotoid from Don Quixote) was not apparent to everyone.[3] Thus I suspected they were still being fazed by the technical jargon. Another problem seemed to arise in thinking up a suitable answer. For some people being put on the spot has a way of limiting the ability to improvise.

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[2] See also J. O'Conner, "Retrieval of Answer-Producing Documents," American Documentation 19:381ff. (October 1968).

[3] Even Ted LeSueur seemed to take everything so seriously. I thought I could at least get a laugh out of him. (See Chapter Three).

After these oral exercises, I next discussed what has been termed the "bibliographic chain,"[4] and showed how an idea might progress from one researcher's mind through professional meetings, reports, journal articles, and books, and finally come to reside in an encyclopedia as part of the accepted wisdom. This train of thought conveniently led me to distinguish primary, secondary, and tertiary sources of information. Primary sources are those which answer questions directly, for example, encyclopedias, handbooks, journals. Secondary sources tell one where to find something in the primary literature, and they include such things as indexes, abstracts, catalogs and bibliographies. Tertiary sources are guides to the secondary sources and the more important primary reference works in a given field.

In the Tuesday session when I had finished talking about these matters I was already running overtime. (The reader will recall that class meetings were scheduled for Tuesday and Thursday 10:30 to 11:30). But I decided to press on because the next item on my agenda would be more appropriately connected with the foregoing than postponed until the next session. That I was running overtime was a bit dismaying, because in preparing I had gone through my lecture notes with a red pencil and tried to mark the place where I should be every five minutes. When I was actually speaking, however, I became too involved in the subject to monitor the time after the first checkpoint. In addition, the exercises took much longer than I had anticipated.

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[4] See G. Grimes and J.M. Doyle, "Information Resources: A Searcher's Manual," (microfiche) ED 034-559. Also S. Herner, A Brief Guide to Sources of Scientific and Technical Information (Washington: Information Resources Press, 1969).

The topic that I squeezed into the first session by running overtime was types of requests. Special librarians have found it useful to distinguish three types of requests for information, because the strategies that must be applied differ in each case.[5] To these three I added two of my own to make five in all, namely: (1) the compilation of comprehensive bibliographies and resource lists, (2) the hunt for specific facts, (3) the selection of a book (or another source) from among many available, usually for the purpose of general background or introduction to a subject, (4) the retrieval of a book (or other source) given some uniquely descriptive fact about it, such as author and title or date of publication or call number, (5) the identification of a book (or other source) given some incidental features, such as size and color.

These five categories are not mutually exclusive, and as I explained to my students, are liable to melt into each other. Nevertheless, they are helpful because there are appropriate kinds of books (and other sources) for each request. Thus an introductory textbook is not ordinarily the best place to go when one is compiling a comprehensive bibliography or seeking a specific fact for the specialist in the field with which it deals. But it might well be selected and recommended as an introduction to the subject. For an exercise I constructed another set of hypothetical requests, this time without fictitious jargon. The student was supposed to determine what type of request was involved. Participation in this exercise was more enthusiastic but still a little reserved, since the types are, as I have said, elusive and, therefore, the answers were not definitely right or wrong.

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[5] See L.J. Strauss, I.M. Shreve, and A.L. Brown, Scientific and Technical Libraries: Their Organization and Administration (New York: Wiley-Becker-Hayes, 1972) 270 ff. Also C.W. Hanson, "Subject Inquiries and Literature Searching," in Handbook of Special Librarianship and Information Work, ed. W. Ashworth (London: Aslib, 1962) 313-341. The 3rd ed. (1967) pp. 415-444 is entirely rewritten but is also a valuable essay.

Although I did make up "homework" exercises for the first unit I tried to design them so that they required a minimum of time and effort. Their purpose was to cause the students, sometime during the intervening week, to reflect on what I had said. The first item, for instance, asked them to recall examples of various types of searches which they had encountered in their previous experience. The lists of readings which I prepared to accompany each unit were also intended to save time. I organized the items roughly in the order of importance, and included only such bibliographical information as I thought necessary for their purposes (author, title, date, TIC call number, relevant pages, annotation where advisable). Thus I reasoned that if an Information Representative had a few spare moments to read something he could start at the top of the list.

The first meeting of the Thursday class was a little smoother, as might be expected, but the discussion of generalities was still not greeted with enthusiasm. I finished a little closer to the appointed time, but I had made a few points which I did not make in the Tuesday class and vice versa. Keeping the progress of the two groups approximately even became more difficult as time went on.

The second session (for both groups) was originally scheduled to deal with request negotiation, but since I had only touched on the overall search procedure, I decided to revise the schedule, so that I could deal with this subject more thoroughly.

I began the second and all subsequent meetings of the class with a brief resume of the previous session. When I checked the "homework" questions I found that all but one or two of the students had done them. Of course, these questions were so designed that students could answer them on the spot if necessary. In conjunction with my discussion of the overall search procedure I distributed handout sheets (See Appendix VII). These were reworked and simplified versions of my earlier model. One sheet showed the various factors that could enter into the analysis of a request. Another detailed the steps in the procedure. To stress that my version was not dogmatic I passed around copies of several other models: the ones given by Bill Katz in Introduction to Reference Work, and the one found in an article by Gerald Jahoda.[6] Although I encouraged comment and criticism on these models, there was none as far as I can recall.

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[6] W. Katz, Introduction to Reference Work, v. 2 (New York: McGraw-Hill, 1974) 137-141. And G. Jahoda, "Reference Question Analysis and Search Strategy Development by Man and Machine," Journal of the American Society for Information Science 25:139-144 (May-June 1974).

One of the notions that several of the models, including my own, stressed was the match between a request and a source of information which will help to fill it. The exercise which I designed to show this concept in action was one of the most successful of the course. I brought ten or twelve books of different sorts (textbooks, handbooks, an annual review, etc.) into class and distributed them.[7] I asked the students to think up a request that would send them to that source. Such "hands on" experience also introduced a wealth of miscellaneous facts. For instance, Jack Henry seemed rather pleased to learn a handbook of communication and control engineering devoted almost an entire volume to mathematics.

Request negotiation was a subject I was hesitant to discuss because I had very little experience in this art, while my students had a great deal. Consequently, I did not want to devote the rest of the second session to it. I needed more time than that. So I spoke very briefly about directories, which are one important source of information concerning professional people. Since acronyms, initialisms and special jargon are also associated with professionals, I inserted a few words on dictionaries.

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[7] See Hanson, "Subject Inquiries," (2nd ed.) 322-323.

The second session had also run a little overtime. So I advised the students to expect the next session to last an hour and a half, and I hoped that I could catch up to my schedule in that time.

As I mentioned earlier, I felt some of my students knew much more than I did about using people as sources and about negotiating requests.[8] Moreover, the treatment of these subjects in the standard works on special libraries did not satisfy me. As a result the bibliography which I prepared listed mainly journal articles and reports. After presenting a very sketchy review of this literature, I proposed some themes for a discussion. These were statements from an article by Ellis Mount which alleged reasons for the failure of communication in libraries.[9] "To what extent do these barriers exist at TIC, and what can we do about them?" I asked. Nearly everyone participated in the discussion and with a moderate degree of interest. Yet the students did not examine things quite as deeply as I had hoped they would.

On the subject of negotiating requests, too, I placed little emphasis on what I myself had to say. Instead I concentrated on a role playing exercise. I drew up a special form consisting of two parts. The top part was an imaginary memo from one of the students addressed to another. It read "Could you get me some information on (blank)." The bottom half was "The real story for (the person who was to play the sender of the memo)." There followed an explanation of the circumstances which the sender knew and the receiver of the memo was to discover. I numbered each whole sheet on the top and bottom, then cut it in half and distributed the halves as the "script" for the role playing episodes.

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[8] This is also obvious from the extent of their experience as described in Chapter Three.

[9] E. Mount, "Communications Barriers and the Reference Question," Special Libraries 57:575-578 (October 1966).

There was one very successful episode and one rather disappointing one. Jack Henry and George Brookover acted their little scene with the self-confidence of two professional poker players. There were several spontaneous comments about the realism of the scene and everyone obviously enjoyed it. On the other hand, in the Thursday meeting, I had apparently not explained the rules of the game clearly enough, for Pat Santoro playing the requester read aloud her half of the form, thus giving away the secret. I understood her action better when I realized that as an executive secretary she had been used to conveying messages, i.e. reading her boss's memos to someone else over the phone. Similarly, past experience had equipped George and Jack to play their roles so well. As a manager of the Columbus plant, George had sent real memos requesting information, and Jack had probably been negotiating requests longer than anyone present. The two incidents I have described were the unusual ones, the other episodes transpiring about as I had planned them.

At about this time, after the third session, we began to encounter difficulties in maintaining the schedule. If I recall correctly, the first cancellation was caused by the visit of a representative from Chemical Abstracts information services. Although I did not learn a great deal from his talk, it was a good review of the publications and services available. His visit was substituted for the Tuesday class. I canceled the Thursday class, too, mainly in order to keep the progress of the two groups equal, although I dimly remember that two of the three members of the class had important commitments to fulfill.

The next meeting (Tuesday) covered the topics of indexes, catalogs, and classification schemes. For several reasons I believe this was the most successful session. The facts concerning these topics are quite clear cut and I not only knew them well, but I knew how to apply them. Thus I could explain what a permuted-title subject index was and I realized that in using it one had to imagine every conceivable keyword that could occur in the author's title. A second reason for the success of this session was that most of the students did not know much about these things. They seemed very interested and asked many intelligent questions. In an exercise I passed out copies of three different works and asked them to examine the organization of material and explain it. I also distributed handout sheets of several standard Library of Congress catalog cards to accompany my discussion which seemed to hold the students' attention. Normally such matters would elicit a groan. That my class received them so well was perhaps as much a reflection on their technical orientation as on my skill in presenting the material.

After this successful meeting with the class on Tuesday, the one on Thursday had to be postponed because the students had important matters to take care of. Before it could be rescheduled, I found myself serving as Reference Librarian eight hours a day, and I continued in that capacity for the rest of the quarter. At first, I had intended to continue the class, but the new assignment became so hectic that I did not have adequate time to prepare for teaching. Then, too, a series of important meetings had preempted many of the students' time.

My last lecture was extraordinary in the sense that I had not originally planned for it. Terry Crowley of the University of Toledo Department of Library and Information Services was teaching two doctoral students in the Department of Psychology the language of information retrieval. I had obtained Jack Ormond's permission to demonstrate computerized bibliographic searching for these two students and for Jeanne Palmer. I think I also offered to let Pat Santoro sit in on this self contained lecture, but she was too busy.

As I stated earlier, I had originally planned to spend six sessions on computerized data bases, of which four sessions were to be devoted to SDC's retrieval language. The extraordinary lecture which I actually delivered incorporated material that would have gone into two or three sessions and I demonstrated on the Lockheed data base because Psychological

Abstracts is one of its files. In my talk I attempted to compare searching a printed index by hand with searching an electronic data base by retrieval program. This led to a discussion of the basic concepts of Boolean operators and their application to search strategy. The lecture ended with an actual search at the computer terminal and a tour of the other automated facilities of the Technical Information Center.

This narrative of the actual conduct of the course has been less detailed than it might have been because when I was teaching I was not assuming that I would write a thesis about my class. Otherwise I might have more detailed notes from which to write. Moreover, the reader must not confuse the details of the implementation of the staff improvement program with the content of the course. This chapter was not intended as a text for such a course. Finally, I hope the reader in reading this chapter did not experience a difficulty similar to the one I experienced in writing it. I found it impossible to refrain entirely from evaluating the events as I narrated them, but I have tried to keep the evaluation to a minimum since the next chapter is to be devoted to it.

CHAPTER SIX

EVALUATION AND RECOMMENDATIONS

Introduction

In the preceeding chapter I reported the actual teaching of the staff improvement course. In this chapter I will evaluate the results of this course as best I can and make some recommendations based on the whole of my internship experience.

Evaluation of the Course

When I first designed the staff improvement course there was to be a final evaluation (what is usually called an examination) and debriefing in the last session. But the class was cut off in the middle so that we never reached that session. Consequently the evaluation must rely on my subjective judgement and perceptions of the students' progress, and my second thoughts about how I would do things differently next time. Since I narrated the events of the course roughly in chronological order, I will organize the evaluation roughly in the same way. Thus I will begin with the overall plan.

The first critical question is: Was the staff improvement course needed at all? Jack Ormond and I thought so, and as a matter of fact most of the students seemed to feel they could improve and round out their skills. But was a class, rather than, say, a tutorial program or directed reading the best means to effect this improvement and rounding out? Given the circumstances of the Technical Information Center I think it was. Lectures and class exercises such as the ones which I designed did not require the students to do elaborate preparation. As I said before a minimum of "homework" was desirable for the TIC staff. Next, a small group situation created gentle social pressures; the students were not afraid to make mistakes and if they did I could correct them instantly for the benefit of all. Desirable actions or expressions, on the other hand, would be reinforced not only by my reaction but also by the very presence of the other students. A word of praise has more value when it is said in front of other people. Finally, a series of shorter classes were preferable to one massive training session, because the students had time to digest what they learned.

There was, however, one shortcoming in the overall design of the course. The students had too little to say about what they needed to learn.[1] Were I ever to teach such a course again, I would meet with all of the prospective students about a month in advance. I would pass out an inventory of the skills I thought they should have, the things I thought they should know, and the things I thought I could teach them. I would try to illustrate these items with answered sample questions so that a person could verify empirically the extent of his knowledge or skill. Having passed out this inventory, I would ask the prospective students to list everything they thought I could teach them which did not appear in the inventory. Then I would ask them to rate themselves in each of the areas listed. Next I would tell them how many class hours were available, not counting the first and last session. I would ask them to write down how much class time they wanted to spend on each topic. Finally, I would collect the sheets and try to develop a plan based on the needs expressed and the patterns which appeared in them. But I would not neglect altogether my personal judgement; after all, the teacher is a member of the class and is entitled to a voice proportional to the amount of work he puts in.

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[1] See J.D. Ingalls, A Trainer's Guide to Andragogy: Its Concepts, Experience and Application (Washington: U.S. Government Printing Office, 1973) sudoc. classification HE 17.8: An 2/973.

So much for the evaluation of the overall plan of the course, I will now consider the success of individual topics. Undoubtedly, the lecture on the nature of information was the clumsiest part of the course. I say clumsiest and not least successful because the objective of this lecture was not so much to impart a fully developed theory of information as to cause the students to develop and become aware of their own thoughts. Yet I would try another approach if I had to do it over again. I would start from practical examples and proceed to raise theoretical questions rather than vice versa. I would also adopt a much more formal style and would even go to the extreme of reading a lecture quite literally. A large part of the material would be quoted from well known authorities. Then at the end of the lecture I would try to precipitate a discussion on the validity of the theory and its further applicability. This whole approach is based on the belief that theories by their very nature give structure to reality as it is perceived, and, therefore, they must be presented in a highly structured and formal way.

After the first lecture came the first exercise. It was to demonstrate that a question implies something about an answer. This exercise was only moderately successful. Perhaps it could be improved by introducing a device that is used in learning foreign languages. This device is the substitution of a blank for a word whose structural function is known, but whose root (and, therefore, exact significance) is unknown. For example, if one did not know what "quixotoid" meant in the phrase "an equation which described a quixotoid" one could replace it with a blank, thus: "an equation which describes a (blank)." So in the revised version of the exercise the student would be told to replace the complicated technical word with a blank before attempting to invent an answer to the question.

The next topic was the discussion of primary, secondary, and tertiary sources. Although they seemed familiar with these forms of literature, the students were surprised by the existence of some of the tertiary sources on their shelves, to the extent that they made audible comments ("Gee, I never knew that was there."). They seemed to have some trouble with the related topic of types of searches when they tried to answer questions in abstract terms. But when they faced the more concrete exercises they were more successful. Thus they easily listed examples of types of searches from their previous experience and had no difficulty in inventing a request which would send them to a given book. The last exercise mentioned could have been improved by including non-print sources. For example, I could have made some slips of paper saying, "Call so-and-so." As to the utility of having presented a search model I have my doubts. Certainly the more experienced Information Representatives learned little from it. Time will tell whether it improved the less experienced.

Request negotiation and the use of persons as sources of information were the topics of the next unit. The success of this episode is difficult to judge, but I can at least say three things about it. First, I made the students aware that interviewing was a skill they could develop and that role playing was one means to do this. Second, in the role playing exercises I gave them the opportunity to compare their own methods with those of their coworkers. Ordinarily they would not have this opportunity to learn by imitation. Finally, the more experienced Information Representatives seemed to enjoy role playing, and to enjoy the most realistic scenes the best. Their enjoyment seemed to spread to the less experienced, and thus the latter seemed to have learned to appreciate a good interview, i.e. to know what they should aim for.

Concerning the session that dealt with indexes, catalogs, and classification schemes, I have already expressed some evaluation in Chapter Four, and I can think of nothing to add.

In the class I never reached the topic of computerized data bases, but the "extraordinary" lecture which I did give on the topic was subject to external evaluation. Perhaps it is just as well that I never covered the topic of data bases, for the new manager of the TIC will probably want to develop a new policy regarding computerized retrieval in view of rising costs.

Recommendations to Owens-Illinois

At his point I must end the evaluation of the class which I taught, not because the evaluation is complete, but because I have no more data with which to work. I turn now to the recommendations to Owens-Illinois. There will be four in all.

(1) The course which I taught was designed for the unique situation. A basic assumption in the planning was that some students already possessed skills and knowledge to an advanced degree. It would not be advisable, therefore, to attempt to use the overall plan and method to instruct a group of people who are new to the Technical Information Center. However, some of the individual learning materials, especially the bibliographies which I produced for my class should be useful in training new people.

(2) The search tools which I produced early in my internship and the revised versions of them are still available, if the TIC could use copies of them. I think the list of static

bibliographies, at least, would be a useful aid to memory. I urge the people at the TIC to update these lists as necessary and cultivate the habit of referring to them when trying to decide where to look for something.

(3) Although I never finished elaborating a model of the search procedure, I have explained why I was not able to do so. If it is necessary to have the results of my work on a model, I would refer the reader to two articles which appeared in the summer 1975 issue of RQ, since they come very close to the model that I was developing.[2] But I reiterate my conclusion that any general model merely passes on the real problem to the person who must apply it in the particular circumstances.

(4) My final recommendation to O-I will probably be wishful thinking. One of the laudable characteristics of the Technical Information Center is that it attempts to bring together information from inside the company with that from outside. Unfortunately, the merger is not quite complete. Physically the card catalog, the different bibliographic tools and the various files that index the Central Document System are still too far apart. In fact, vestiges of the separation between the Research Library and the Technical Information Center still remain. I realize that the measures necessary to remedy this situation--converting the entire card catalog

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[2] J. Benson and R.K. Maloney, "Principles of Searching," RQ, 14:316-320 (Summer 1975), and F. Holler, "Toward a Reference Theory," RQ 14:301-309 (Summer 1975).

to machine readable form or the CDS to catalog cards, or massive rearrangement of furniture--these measures are not very feasible. Nevertheless I mention the problem because small steps in this direction may be possible--for example, consolidation of the author files of the CDS with the card catalog.

Recommendations to the Department

My recommendations to the Department of Library and Information Services are derived from the whole of my internship experience, not merely the staff improvement course. They fall into four groups concerning (1) the generalist or theoretical "track" of the program, (2) the teaching of library automation, (3) things I learned in teaching the class at O-I, and (4) ways to expedite thesis writing.

(1) If there is to be a theoretical track in the program, there must be a thorough survey of information science and library literature before the thesis. Perhaps I should have been reasured, because I independently rediscovered Gerald Salton's model of information retrieval. The opposite was the case. In the ideal world, I should not only have read Salton's book and everyone else's before I started to work on a model, but I should have met these people and talked with them personally. In most theoretical research disciplines it is an unwritten rule that the thesis advisor will accept topics only in his narrow field of specialization, the field in which he has read and continues to read everything that is

published, and that the advisor will introduce his protegés to the scientific community. When these unwritten rules are abrogated, the student is usually the one who suffers the most because he will almost certainly make a complete fool of himself if he attempts to participate in theoretical discussions. Moreover, he will do this at a time when his self-confidence is most vulnerable. I suggest, therefore, that the department either follow these unwritten rules or give up the idea of a theoretical track.

(2) The express purpose of the department's library automation course was not to make the students into systems analysts but rather to enable them to deal with systems analysts. Yet I found myself being urged to use conceptual tools which clearly belong to systems analysis, to invent a model, which is the job of a systems analyst. In the end I decided to give up work on the model because my command of the mathematical conceptual tools was not adequate to describe the real situation I was trying to describe. In the future, I suggest that the purpose of the automation course be kept in mind, and that systems analysis be left to those who are trained to do it.

Also related to the topic of library automation is the question: was O-I an appropriate place to learn more about it? As I reported in Chapter Two, the fundamental assumption in justifying internships in profit making organizations was that one could observe things that these organizations do and apply the observations to the information facilities of non-profit organizations.

Now the design of an information system must always depend chiefly on the intrinsic properties of the information which it is to handle. But as I pointed out in Chapter Two, the properties of social service information are not all the same as those of scientific and technical information. Hence the applicability of the observations is somewhat reduced. Moreover, at O-I I observed and used existing automated systems. Yet the problem in nearly any community organization would be to design and build a system, which is far different sort of problem. Again the applicability of the experience diminishes.

But the major disadvantage of the internship experience was the proclivity of the entire situation to reinforce a belief that more is better. Because Owens-Illinois has invested more money in their technical information center than most organizations have, and because they have a greater assortment of mechanical and electric devices, their information system is not necessarily an example for social agencies and community organizations to emulate. I say this for two reasons: one is the contemporary political mood; the other is the inherent nature of the art of information retrieval.

In politics people seem to be disgusted with gargantuan bureaucracies. They seem to be forming small ad hoc groups to solve local and even neighborhood problems. "Do it yourself," is the watchword. Consequently people distrust large centralized information systems especially if they are thought to employ computers. Let us pass over the CIA, FBI, and NASA.

Defense contractors first showed us what an automated information retrieval system was. The DoD was largely responsible for developing Operations Research and Systems Analysis. Largely as a consequence of automation and the translation of humane words into mechanized numbers the huge defense establishment seemed to become one chorus with a single cry, "More!" More money, more men, more time, and we would win the war in Vietnam.

In certain crucial ways community organizations are the opposite of a large corporation like O-I. Corporations depend on large amounts of capital to buy complicated machines so that they need to hire fewer and less expensive workers. On the other hand current political trends favor community organizations which employ little capital but large groups of volunteer workers. For if I read the contemporary mood correctly, people are discerning that the war on poverty was founded on the same assumptions as the war in Vietnam. And they are chorusing, "No more!"

Under these circumstances what is needed is what the art of information retrieval demands anyway.[3] In art more is not always better. The best artist is not the one who can amass the greatest collection of tools and materials, or the one who can create the largest work. Rather he is the one who can do more with limited resources than anyone considered possible. Because he knows the nature of his material and his tools, and because he has creative imagination, the artist can select wisely the most appropriate means from among the many at his disposal.

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[3] See also F.L. Scheffler, "A Novel Philosophy for the Design of Information Storage and Retrieval Systems Appropriate for the '70's," Journal of the American Society for Information Science 24:205-209 (May-June 1973), and L.B. Marienthal, "Small Computers for Small Businesses," Datamation 21:62-78 (June 1975).

These considerations about the internship suggest some recommendations about the course in library automation. (a) The title should be changed to "Information Systems and Equipment." This change would connote that automation, i.e. the use of automatic machines and computers, is only a small part of the course and not its focus. (b) The students should not be required to learn enough BASIC to calculate the exponential growth of a book collection. If they learn any computer language at all it should be something like the retrieval languages of SDC, Lockheed, or MEDLARS. In mastering this language they would have to learn Boolean logic and the relation between indexing, classification and automated retrieval strategy. (c) There should be a new section of the course devoted to intermediate technologies. This means all the various inexpensive manual tools and materials used in offices and libraries, for example, tabs, colored paper and index cards, Bates numbering machines, etc. In short, all the items a small community organization could reasonably be expected to buy would be included. Besides knowing the existence of these things the students should learn how and when to use them to best advantage. In doing so they would probably also have to learn some of the fundamental concepts of Information Science, for example the fallacy of the perfect dictionary.[4]

(3) My third set of recommendations to the Department concerns what I learned in teaching the class at O-I. (a) I recommend the planning process described in Chapter Three and amended in the present chapter.

(b) I recommend that the Department incorporate into its thinking the doctrine of the five types of requests.[5] If this teaching must be confined to a single course, it would probably be the Information Sources course. I do not know how this course is taught at present, but when I took it secondary sources for locating bibliographic citations were emphasized to the neglect of primary sources (encyclopedias, yearbooks, handbooks, specialized dictionaries, directories). Also in connection with the five types of requests, I urge the Department to question whether compiling a single large bibliography is adequate internship experience, since it exercises technique and strategy in only one type of search.

(c) Somewhere in the program students ought to be introduced to the practical consequences of knowing the various genres of books and documents. I have in mind something like the exercise in which I asked my students to invent a request that would lead them to a given book. This teaching might conveniently be combined with explanations of the "bibliographic chain" or the structure of literature.

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[4] See P.K.T. Vaswani, "Information Storage and Retrieval," in Encyclopedia of Linguistics, Information and Control ed. A.R. Meetham (New York: Pergamon Press, 1969) 225-226. I recommend the whole article.

[5] See Chapter Five p. 85 and n. 5.

(4) Finally, I have some recommendations as to how to expedite thesis writing. (a) I believe that my first attempt to write a thesis ended as it did because Miles did not visit me and express his vague disapproval until late in the internship period. Had we been in contact earlier, he probably would have suggested a different sort of thesis, or at least I would have had more time to examine the feasibility and the risks of the thesis he did suggest before I decided to try it. Originally, the interns met with the faculty every week in a seminar. Whatever the shortcomings of this seminar, it did stress the need for regular communication. When this seminar was later dropped in an episode of what I considered hasty judgement with inadequate information, advisors were urged to "keep in touch" with their advisees. Human nature being what it is, this meant that communication became far less frequent. I suggest, therefore, that in some cases the faculty reconsider whether the apparent failure of the seminar as a means of communication was not due to factors unique to the situation or unrealistic expectations, and whether the seminar should be restored. In any case there must be regular, I would say weekly, contact between interns and their advisors.[6]

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[6] In fact, since this was written the faculty has reconsidered and restored the seminar.

(b) I urge that every intern be given the opportunity to have a debriefing, if he so desires. As soon as possible after the end of the internship, he would meet with a couple of faculty members and perhaps a couple of students. They would hold a long rambling conversation about what happened, what he recommends, what he intends to write in his thesis. The conversation could be tape recorded at the intern's request. But if this meeting has to be scheduled more than a month after the internship, it might as well not occur.

(c) The circumstances that distinguish the thesis writing period from the rest of the program are loneliness and lack of regular reinforcement. To remedy these undesirable side effects, I propose that thesis advisors should try to speak with their advisees at least every week. More than two weeks of isolation should be considered intolerable. The communications need not be long and elaborate. A five minute phone conversation would be quite adequate.

Behind all three of these recommendations is the premise that many people find it easier to write about something if they have practiced what they intend to say by talking about it. Crossed out words clutter up a page, but rejected expressions do not fill up the mind.

Recommendations to Future Interns

(1) Future interns from our program at the Owens-Illinois Technical Information Center, will probably encounter conditions significantly different from the ones described in this thesis.

I advise them to take this into consideration.

(2) Interns should not get into the bad habit of taking work home from the office, or if they do, they should demand a corresponding amount of time off.

APPENDIX I

HANDOUT FOR INSTRUCTING TIC STAFF
HOW TO GET ON THE SDC DATA BASE

(A copy of the original document, unedited except for the deletion of the code word).

HOW TO GET ON THE SDC DATA BASE

Be sure the teletype is turned ON.

Be sure the phone is switched to "local" and the "talk" button is pushed in.

Pick up the phone and dial 201.

The operator will answer and ask for an area code.

Tell her first that you are going to transmit data, then give her the area code---213.

Then she will ask for the number you are calling---which is 828-9141.

Then she will ask for the billing number. It is 7214.

Then she will ask for your name and extension.

*Wait for the high-pitched, steady beep.

*Push the "data" button down until the "talk" button pops back up.

*Hang up the phone.

(*If you make a mistake in the order of these steps and the transmission is interrupted, the "interrupt" light on the front of the teletype goes on. You have to place the call again and tell the operator that the call was interrupted.)

Now type as follows. /LOGIN△ (Push the "return" key.)

(△= a blank space.)

If you happen to log on during a window change, you will receive a message that the system is down. Don't hang up. Just wait until after the window change and log on again.

Speaking of interruptions, never raise the clear plastic plate which holds down the stationery to the teletype "roller", since doing so while on line will also cut off the connection.

To log off the SDC system (as opposed to one file in the system) type: "STOP"

APPENDIX II

PROPOSAL FOR NEW AND REVISED SEARCH AIDS

(SUBMITTED JULY, 1974)

(Unretouched copy of the original document)

Here are three proposed "tools" for searching.

(A) A set of "interview cues" (the outline headed REQUEST). This list is in no way intended to substitute for experience in drawing out information, but it might (1) aid in defining the subject by suggesting questions to ask and (2) insure that the record of the request is complete by articulating things that are taken for granted.

(B) A "source array". This is to replace the list on the back of the present search form. The "array" consists of two parts (1) the array itself which presents commonly used sources in a very abbreviated fashion but attempts to list them systematically, (2) a longer list of sources which is subdivided into continuing indexing and abstracting services and dated, completed bibliographies. Only the first part of this longer list is enclosed with this proposal. A few items could be added to the bibliographies section and a subject index for it provided. There probably ought to be a third section on the SDC data base--a revision of their table adding overlap with printed sources, and keyword source.

Items (A) and (B,1) could be placed on the back of the search form or could be reproduced on durable stock, covered with plastic (or laminated) nd hung up by the telephone, taped to a clip board, or otherwise prominently displayed (like the ever present periodic tables). (B,2) would be a handout of 3 or 4 pages.

(C) A new version of the search report with a section called a "search checklist" which augments or replaces the procedure and results section. The purposes of this form are: (1) to insure completeness especially in keyword usage in searching printed indexes (2) to avoid duplication if a later search is done on the same subject (you pick up where you left off). This check list could be put on the reverse side of the search report or it could replace the procedure and results section.

[illegible]

REQUEST

Perspective:	Theory, formulas Data, experimental results Methods, techniques, processes Standards, specifications Costs, suppliers, economics Other
Form:	Citations Abstracts Text Other
Scope:	Years covered? General or specific topic? About how many items? Languages?
Constraints:	Deadline Cost

Do you [illegible] you've got a good [illegible]

SEARCH SOURCES

Company:	Person	~~Prev. search~~		CDS	~~MDS~~	
Printed indexes:						
(More than one field)	CCAT SGBIP ETLA	AS&T ✓ BPI ✓	[SCI]	GRA&I ✓ MC TAB	DAI MT ✓	~~SRI~~ ✓ ~~VSMF~~
(One broad field)	C&CA ✓ CEA ✓	[EI] ✓	PHA ✓	CHA ✓	[IM] [EM]	[BA]
(Narrower fields)	PKA ✓ GT, CA, IPCA ✓ PCG ✓	MA ✓ LA ✓	RA ✓ TAA ✓	AA ✓ NSA ✓ ~~[illegible]~~ ~~[illegible]~~	~~L&M~~ JCLA ✓ ~~[illegible]~~	APA ✓ PLA ✓ EVI ✓

Electronic data bases:

	INFORM	CHEMCON	COMPENDEX	SCISEARCH
	NTIS	CHEM7071	GEO-REF	CAIN
	*ERIC [ERIC]	PREDICASTS ~~PLASTEC~~ *APILIT *APIPAT		[MEDLARS/ MEDLINE]

~~PLASTEC~~

Printed bibliographies.

~~Shelf~~ "Quickie"

PLASTEC MDS VSMF CE

~~SRD~~ SRI

MF

List of Continuing Indexing and Abstracting Services

//=outside O-I Tech. Info. Center

AA	Analytical abstracts	[illegible] —
APA	Air pollution abstracts	
AS&T	Applied science and technology index	1957—
/BA/	Biological abstracts	[illegible] 1940—
BPI	Business periodicals index	195[illegible] —
CCAT	Card catalog of TIC holdings	[illegible] —
CE	Chemical economics (Stanford Research Institute)	current [illegible]
CHA	Chemical abstracts	19[illegible] —
C&CA	Computer and control abstracts	19[illegible] —
DAI	Dissertation abstracts international	1967— (… Doctoral Diss. 1955-1967)
EEA	Electrical engineering abstracts	[illegible] —
/EI/	Engineering abstracts	
/EM/	Excerpta medica	
EVI	Environment index	[illegible] —
GRA&I	Government reports announcements and index (back issues microfilm)	1946 —
GT	Glass technology	[illegible] 19[illegible]—
/IM/	Index medicus	
IPCA	Abstract bulletin of the Institute for Paper Chemistry	1930—
JCLA	Journal of current laser abstracts	[illegible] —
LA	Lead abstracts	[illegible]
MA	Metals abstracts	(> [illegible] 1944—)
MC	Monthly catalog of government publications	19[illegible] —
MF	Megafile series (Stanford Research Institute)	current [illegible]
MT	Masters these in pure and applied science	1957—
NSA	Nuclear science abstracts	
PHA	Physics abstracts	1958—
PLA	Pollution abstracts	[illegible] —
PKA	Packaging abstracts	[illegible] —
PTLA	Publishers' trade list annual	[illegible]
RA	Rheology abstracts	1964—
/SCI/	Science citation index (TIC has only 70-74)	[illegible] 1973
SGBIP	Subject guide to books in print	[illegible]
SRI	Stanford Research Institute Long range planning report, etc.	1955—
TAA	Thermal analysis abstracts	1972—
TAB	Technical abstracts bulletin	[illegible] —
~~VSMF~~	~~Visual search microfilm catalogs~~	[illegible]

STET

DPP

DPP - Directory of [illegible] 1955—

Reference Sources [current available [illegible]]

CE

MF

SRI

VSMF

List of Dated, Completed Bibliographies

Title	Dates	Abs.	Call #
B. of bs. on chemistry and chemical technology	1900- 1931	no	Z5521 N19
B. of glass- Duncan	to 1940	no	Z6048 D91
B. of literature on minor elements and their relation to plant and animal nutrition	to 1947	yes	Z5074 C
B. of paper and thin-layer chromatography	1961- 1970	CA#	suppl. J. of chromatog.
B. of papermaking and patents	1900- 1963	CA#	Z7914 P
B. of the platinum metals	1931- 1940	CA#	Z6679.P7 H83
B. of solid adsorbents	1943- 1953	yes	Z7914
B. of the stable isotopes of oxygen (O^{17} and O^{18})	to 1957	CA#	Z5524 S
Carbon monoxide, a b. with abstracts	1880- 1966	yes	Z7890 P96
Chemical durability of glass, a b-ic review of literature	to 1973	no	Z6047 In8
Comprehensive b. on cement and concrete	1925- 1947	no	Z7914
Cruching and grinding, a b.	to 1958	yes	Z7914.M6 G79
Digest of literature on dielectrics	have 1946- 1969	no no auth.	Z5834 P48
Electric properties of materials: a guide to the literature	to 1966	no no auth.	Z5838 E
Ferroelectric materials and ferroelectricity	to mid 1969	no	Z5834 C76

etc, etc.

INDEX TERMS:

SEARCH NO.

RETRIEVAL NO.

DATE

SEARCHER

LAST DOC. NO.

REQUESTER

(DIV.) EXT.

REQUEST:

Search Checklist

Source	Keyword/Code	Years/Issues/etc.

APPENDIX III

JOB DESCRIPTION PREPARED FOR LOU ALLEN

(Unretouched copy of the original document)

As is apparent from the etymology of the word re-search, the effort to create new knowledge generally begins with a survey of the collective memory. To discover what has already been discovered is accounted a superfluous effort. In modern corporations which (like O-I) have extensive research efforts, it is customary to divide the labor between the scientists and engineers who create new knowledge, and the information specialists who attempt to locate what others have already discovered about the subject and reported in the literature. Since the previous knowledge of the scientist or engineer is the controlling element, the literature searcher usually works to fill his requests.

In the operation of the O-I Technical Information Center there is a further division of labor in that there are two kinds of information specialists. One sort is recruited form the various divisions of the corporation which the TIC serves; the other is comprised of library professionals. A specialist of the first sort is called an information representative. He usually serves as a liason with his old division, and perhaps a couple more besides. His mission is not simply to receive requests passively but actively to seek "customers" and "sell" the services of the information center.

Information specialists of the second sort have typically less technical backgrounds and fewer contacts with other divisions of the company. In addition to searching, they perform the various other duties necessary to the functioning of an information center: acquisitions, cataloging, reference, etc. As an intern I consider myself a part of this second group, except that I have no "other" duties besides searching. My project might be counted as such.

Now the search process. It begins with an interview between the requester and the searcher. Obviously, the first thing to find out (if you don't already know it) is the name and (corporate) address of the requester. This not only ensures that the right person gets the results of the search, but also is helpful context for divining the purpose of the request and the interests which lie behind it. The next question is: what does the requester want to know? People often have trouble understanding that there are many different ways to be interested in one subject, and that it takes time draw out exactly what they want. Here are a couple of examples.

One man called in asking for some information about transistors. What did he want to know about transistors? Well, he was interested in reliability. What did he mean by that? Life or life span was a synonym. Well, did he want to know the life of various transistors on the market or what? It turned out that he wanted a mathematical formula stating the relationship between hours of use, voltage, materials etc. and the expected life of a transistor.

In another case, the requester wanted data on the interface of gold or silver with a gas. Now this could have been in the context of making decorative or special glass, in which case the aim would have been to eliminate gas bubbles. The true context, however, was the manufacture of electronic display pan~~n~~els in which a gold or silver wire would be used to conduct an electrical current and cause the gas to ionize and emit light.

Other questions we resolve in the initial interview are: the form of the product to be delivered (citations, abstracts, text), the scope of the search (specific or general, how many years to be covered, what languages, about how many items), the deadline and any other constraints (e.g. corporate secrecy). The searcher also tries to familiarize himself with the terminology of the request, if necessary, before proceeding. At this point we also fill out a search form and record the request in a search log.

Once we have received the request and clarified it as much as possible, we decide which sources we ought to use. In the TIC the resources at one's disposal may be divided into three main categories. First, there are company sources. Persons who have worked with the problems of one technical process for many years acquire unparalleled practical know how, and a good bit of theoretical background too. In addition, a coordinate indexing system enables us to find documents pertaining to nearly any subject that an O-I employee has written about. As an intern I have not used the internal document system, although it has been explained to me.

Printed publications form a second group of resources. TIC subscribes to nearly every indexing and abstracting service that deals with its technical field. Little needs to be said about familiar tools like the Applied Science and Technology Index or Chemical Abstracts. The card catalog of the TIC holdings is also a frequent help. I have had occasion to use the Subject Guide to Books in Print and I hope they will follow my example.

The third major resource is the Systems Development Corporation electronic data base. This is divided into thirteen separate files, but we use only four or five of them frequently. The art of searching computerized bibliographies is still young and presents some unique problems. Some of these can be solved at this end of the terminal by developing a sound search strategy, locating the proper thesaurus, etc. But many difficulties originate at the other end and are to be remedied by measures such as using a more limited indexing vocabulary, or providing a cheaper but less flexible program, etc. It is relatively easy to learn how to use the SDC data base. You simply follow their manual. To use it effectively requires practice.

The next step in the search procedure (after we have selected a source) is much the same for all sources except persons. It is as follows: plan, test, execute, repeat. Planning means developing a strategy for retrieving all the needed information and only the needed information. Usually, it implies finding or guessing the magic words. under which the information is stored. Where printed indexes are involved testing is a relatively simple trial run through the last annual cumulative issue. You try one keyword after another until you appear to be getting good results. In testing a strategy for a computer search the object is to discover whether the tactics will work before you make a $3 long distance phone call and plug in to a $90/hr. program. With some files this is easy enough because they are based on printed sources (CHEMCON-Chem. Abs.:; NTIS-Govt. Reports Abs. and Index). With others there is almost no way to do it. When information is needed in a hurry or when only one or two specific items are requested, the testing phase is omitted.

There is not much to say about the actual execution of the search. In the case of printed sources it simply a matter of repetition of the successful trial run. We generally use the xerox machine to copy any reference longer than a line or two. For the older issues of Government Reports Abstracts, microfilm prints are the usual form of reproduction. Executing a search of an electronic data base entails calling the SDC center, entering the program, searching the keywords according to plan and printing out the results. Sometimes the planned search strategy does not work, i.e. it turns up too much or too little. In that event you have to revise your plans on the spot.

Usually the next step is to deliver a list of titles or a collection of abstracts to the requester. Abstracts are edited by cutting and pasting and xeroxing. After studying the list of material the requester either orders copies of some items or all items or tells you to try again.

Finally, the completed search form is attached to a copy of the bibliography that has been produced. It is indexed so that it can easily be retrieved for future use. What little there is in the way of evaluation occurs at the daily morning meeting of information representatives and search personnel. We report new searches, the status of pending ones, and the results of old ohes; we plan strategy, catch up on corporate gossip and mostly drink coffee.

APPENDIX IV

FIRST DRAFT OF MODEL

(Unretouched copy of the original document)

The stated goal of the Technical Information Center is to provide "infromation services and systems specifically designed for the entire O-I technical community". This statement of purpose immediately suggests the usual model of information transfer which is presented in Figure 1. To apply this model to the TIC in the broadest terms, the source is a person, whether O-I employee or not, who has an idea. The receiver is a TIC patron. The usual channels of communication are printed publications, typewritten company documents, telephone calls or personal interviews.

Searching is one of the last services provided by the TIC, in the sense that it can not occur unless certain other services were performed first. In other words, when we search for information in a printed publication we assume that someone has written it down, someone else has printed and published it, someone has indexed or otherwise analysed it, the TIC has acquired (or can acquire) the index or the document, has cataloged, classified, labeled and shelved it, can locate it and can lend or photocopy it. (Cp. Vickery, Information Systems, 23, 25, 227&228.) Given all these services, the users of the information center could do their own searching, and some of them do. When we search for a company document or an expert among O-I employees, there are fewer prerequisites, but they do exsist and are similar in nature.

I will now attempt to write a programatic description of searching.

[illegible]

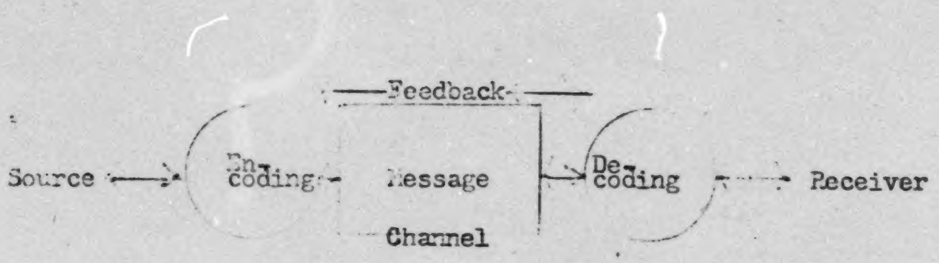
Feedback
Source
En-coding
Message
Channel
De-coding
Receiver

Figure 1.

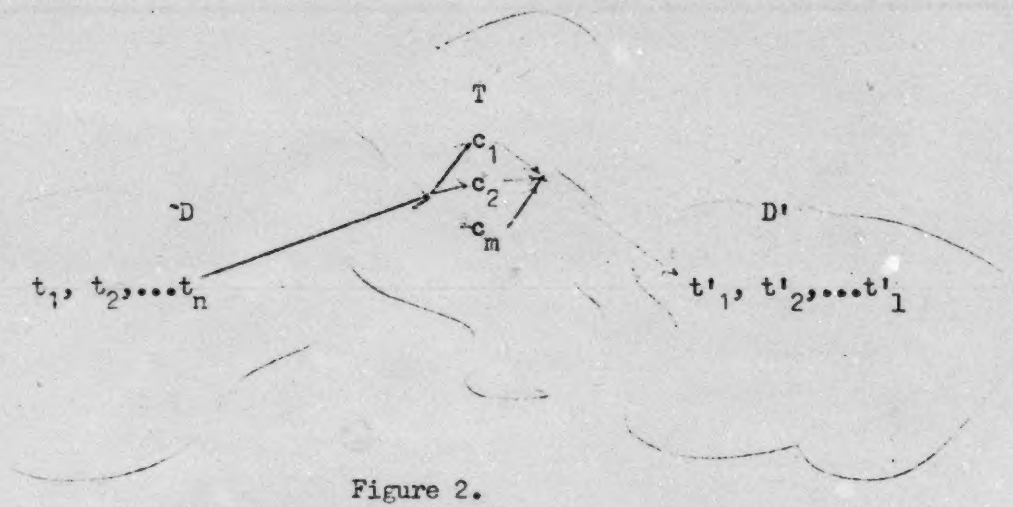
T
c_1
c_2
c_m
D
D'
$t_1, t_2, \ldots t_n$
$t'_1, t'_2, \ldots t'_l$

Figure 2.

I. Request phase

A. Searcher asks for request and context.

B. Requester (re)states request and context.

C. Searcher records request.

D. Searcher analyzes request.

E. Searcher decides whether to repeat form I. A.

II. Strategy phase (Searcher is agent.)

A. Decide whether this is a test or a complete run.

B. Select source(s).

C. Select key(s).

D. If personal source is selected go to V.

E. Go to source(s) and key(s) to examine information.

F. Evaluate relevance, completeness.

G. Decide whether to copy.

H. Decide whether to record key(s).

I. Decide whether to repeat from II. C.

J. Decide whether to record source(s).

K. Decide whether to repeat form II. B.

L. Estimate time (cost) needed for further search.

M. Decide whether to repeat from I. A.

III. Requester's feedback

A. Searcher delivers findings to requester.

B. Searcher records delivery.

C. Requester evaluates relevance, completeness.

D. Searcher records evaluation.

E. Requester evaluates time (cost) needed for further search.

F. Requester decides whether to repeat II.

G. Searcher decides whether to repeat I or II.

H. If no testing was necessary (II. A.) stop.

I. If IV has been completed stop.

IV. Execution (Searcher is agent.)
   A. Go to selected source(s).
   B. Go to selected key(s).
   C. Coppy information.
   D. Record progress.
   E. Repeat form IV. A. untill all sources, keys exhausted.
   F. Go to III.

V. Arranging an interview
   A. Contact personal source.
   B. Explain nature of request and give requester's name.
   C. Decide whether the source can possibly furnish the requested information.
   D. Record contact.
   E. Go to III.

Although many of these steps could be, and will be spelled out in great detail, I think it more profitable to go in the other direction first, and present a more generalized view. If we attempt to analyze phasr II according to the usual podel for information transfer, we encounter many difficulties. When the searcher opens an index is he sending a message to it or is it merely a channel, or is it also a decoding device to lead you through a maze of articles? At any rate, there can be no feedback because the ultimate source of the information is not present. Why these problems arise ought to be obvious. In the perspective of the larger process of communication, literature searching would have to be considered as a part of decoding. Consequently I propose a special model of the searching process based on translation rather than transmission.(Figure 2.)

The translator (T) receives a message in certain terms (t_1, t_2,...,t_n) from one domain (D, be it a language, jargon, code or whatever) analyzes them into concepts (c_1, c_2,... c_m), then finds the terms (t_1', t_2',...t_1') in another domain (D') which best fit the concepts. The amoeboid figures are employed instead of square boxes to show that the domains and the translator are ill defined and constantly shifting. Finally, the subscripts n, m, and l indicate that there is not a one to one correspondence between the terms of one domain and those of another or bewteen terms and concepts.

The essence of searching is to translate the language of the requester into the language of the sources of information. You must decipher what the requester wants and then divine what the source is going to call it. At a higher level you must guess which source ought to contain the desired information.

PAGE (S) 129-138 ~~WAS~~ (WERE) ~~MISSING~~ (REMOVED) FROM THIS DOCUMENT PRIOR TO ITS BEING SUBMITTED TO THE ERIC DOCUMENT REPRODUCTION SERVICE.

Should you desire a copy of Appendix V-Revised Draft of Model, they are available from the author:

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APPENDIX VI

COURSE OUTLINE

(Unretouched copy of the original document)

Unit	Topics
1	An overview of the searching process. Kinds of requests.
2	Negotiating the request. Using personal sources (i.e. persons as sources). Directories.
3	The library catalog and classification. The way indexes are made and arranged. Bibliographic tools that control documents at the source.
4	Spceific current indexes.
5	Systems Development Corporation's retrieval language. (first session).
6	Current indexes. (if not already finished). The more important primary sources. Static bibliographies.
7	SDC retrieval language and strategy for using it. (second session)
8	SDC (session three).
9	Other automated data bases (Lockeed, Plastec, etc.)
10	SDC (final session).
11	CDS (Central document system) and Termatrex)
12	Summary. Final exercises. Debriefing.

APPENDIX VII

MODEL AS PRESENTED TO CLASS

(Unretouched copy of the original document)

Analysis of requests

Type of search: exhaustive coverage of an area
- specific fact
- selection of sources

Constraints: time (deadline)
- cost
- secrecy
- (protocol)

Requirements of request: subject area
- perspective (application, requester background)
- kind of information (primary, secondary)
- period to be covered (if any)
- recentness
- quantity
- (medium)
- (language)

Search procedure

Recieve request.

Analyze request.

Record request and analysis.

Is familiarization necessary. (If yes, familiarize.)

Is testing necessary? (If yes, remember this is only a test.)

Select sources.

Determine keywords.

Go to a source.

Go to a keyword.

Is the keyword there? (If no, try again.)

Record source and keyword.

Evaluate findings. (Do they satisfy the request?)

Select means of delivery.

Deliver.

Recieve feedback.

Record feedback.

If this was only a test repeat from 'Go to a source.'